FACT SHEET FOR STATE WASTE DISCHARGE PERMIT ST- 5213

Basic American Foods

SUMMARY

Basic American Foods owns and operates a potato processing facility near Moses Lake, WA (Grant Co.). Approximately one million gallons per day of process wastewater is land applied year around to approximately 2300 acres via center pivot irrigation. Supplemental water is provided from 17 on-site wells.

Past wastewater application and farm practices at the sprayfield site have adversely impacted the ground water beneath the site. Nitrate levels exceed the ground water criteria in a plume that nearly extends the length of the sprayfield site. An independent review of the design and ground water information for the land treatment system concluded that the Permittee's sprayfield system appears to be continuing to impact the ground water beneath the site. However, annual sprayfield reports appear to show water and nitrogen loadings to the site are generally less than the crop requirements. The permittee has informed Ecology of its intent to respond to the independent review.

The proposed permit will limit the application of wastewater to the design treatment capabilities of the crops on the sprayfields as presented in BAF's engineering report for the site. Restrictions will be placed on how soil salinity will be controlled. Best management practices will also be included to reduce the potential of soil percolate from the fields to impact ground water.

Sampling of the wastewater, soils, ground water, and crops will continue. The submittal of annual irrigation and crop plans will be continued to demonstrate that the system is in compliance with the permit limitations and BMPs, and to show that the system is operated as it was designed.

BAF will be required to submit a vadose zone monitoring plan. Data will be used to validate estimated soil percolate nitrate values that were used in a risk analysis by BAF to assess the potential impacts to the ground water from their current sprayfield system, and a better understanding of the nitrogen dynamics in the soils during the season when the potential for leaching of nitrates is high.

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INTRODUCTION

This fact sheet is a companion document to the draft State Waste Discharge Permit No. **ST-5213**. The Department of Ecology (the Department) is proposing to issue this permit, which will allow discharge of wastewater to waters of the State of Washington. This fact sheet explains the nature of the proposed discharge, the Department's decisions on limiting the pollutants in the wastewater, and the regulatory and technical bases for those decisions.

Washington State law (RCW 90.48.080 and 90.48.162) requires that a permit be issued before discharge of wastewater to waters of the state is allowed. Regulations adopted by the state include procedures for issuing permits (Chapter 173-216 WAC), and water quality criteria for ground waters (Chapter 173-200 WAC). They also establish requirements which are to be included in the permit.

This fact sheet and draft permit are available for review by interested persons as described in Appendix A--Public Involvement Information.

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in these reviews have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Changes to the permit will be addressed in Appendix D--Response to Comments.

GENERAL INFORMATION	
Applicant	Basic American, Inc.
Facility Name and Address	Moses Lake Facility of Basic American Foods, 538 Potato Frontage Rd, Moses Lake, WA 98837
Type of Facility	Potato Processor
Type of Treatment:	Land Treatment via spray irrigation
Discharge Location	2 miles SE of Moses Lake along State Hiway 17 Latitude: 47° 03' 27.9" N Longitude: 119° 15' 59.7" W.
Legal Description of Application Area	Approx 2300 acres located 2 miles SW of the processing facility in: Sec. 11, 14, 15, 22, and 23, T. 18N., R. 28 E Latitude: 47° 02' 37" N. Longitude: 119° 16' 49" W.
Contact at Facility	Name: Mike Dodds, Resource Manager Telephone #: 509.766.7876
Responsible Official	Name: Brian Meiners Title: Plant Manager Address: 538 Potato Frontage Rd, Moses Lake, WA 98837

GENERAL INFORMATION	
	Telephone #: 509.766.7876 FAX # 509.766.3232

BACKGROUND INFORMATION

DESCRIPTION OF THE FACILITY

Basic American Foods owns and operates a potato processing facility that is located approximately three miles south of the city of Moses Lake (Grant Co.) along state hiway 17 (Fig 1). Except for periodic down-time periods for sanitation and maintenance, the facility operates year around and processes approximately 400 x 10^6 pounds of raw potatoes into 70 x 10^6 lbs of dehydrated potato granules.

INDUSTRIAL PROCESSES

Freshly harvested and/or stored potatoes are trucked to the facility and off-loaded at the raw receiving area where they are washed and then flumed into the processing facility. The dehydration process includes: steam peeling, cooking, blending, dehydration, and packaging.

There are two main process wastewater streams: mud-water from the raw receiving area where the potatoes are off-loaded and washed and flumed into the processing facility, and process wastewater from the main dehydration facility.

TREATMENT PROCESSES

Flume/wash water

The flow volume of the mud-water discharge is approximately 50,000 gpd. The raw receiving water is circulated and reused as much as possible before being discharged. When discharged it is sent to a mud removal system where the mud is settled out. The water is sent to the main process wastewater system and the mud is removed and land applied.

Process wastewater

Wastewater from the dehydration facility makes up the bulk of the wastewater discharged from the dehydration facility; approximately 0.85 mgd. It is collected in a floor drain system and gravity flows to a screen system. The screened water then flows to a wastewater pump station to be sent to the land treatment site.

The combined waste streams are pumped to the land treatment site from the wastewater pump station where two pumps (primary and backup) are located, each capable of handling the entire waste stream. Wastewater flow from the pumps is sent through an 800-micron self cleaning filter and then to the fields.

LAND TREATMENT SYSTEM

The land treatment site is located approximately 1.5 miles SW of the processing facility in the sand dune area adjacent to the Potholes Reservoir (Figs. 1 and 2). It is comprised of 23 center pivots totaling approximately 2300 acres. Supplemental irrigation water is provided by 17 wells located throughout the site. According to the O&M Manual (BAF, 2001), there are two operator personnel for the site and are accountable for the day-to-day operations of the site; planning,

scheduling, and coordinating daily operations and maintenance. Irrigation and crop management of the sprayfield site is done by a hired consultant

History

The BAF facility began irrigating its process wastewater in 1966 on a 206 acre site. It was operated as a high rate filter/treatment system. Wastewater was applied until saturation to promote denitrification, and then allowed to rest to promote nitrification. The hydraulic load was approximately 5ft/acre/year. This operation continued until 1992.

In 1992 BAF began to improve and expand its sprayfield system to 455 acres to reduce nutrient and water loading. The expansion was completed in 1994 (fields 16-19, Fig. 2) and included the conversion of the original 206 acres to center-pivot irrigation systems and the leveling of the sand-dune topography to install the new center-pivot acreage. The construction of the new sprayfields displaced approximately 8×10^6 yards of sand material. The completed sprayfields are sometimes referred to as the BAF fields.

The sprayfield expansion continued in 1996 by entering into a long-term agreement with an adjacent land owner to add approximately 1850 acres of center-pivot fields (fields 1-15; Fig. 2). The expansion was completed in 1998. These are referred to as the I/C fields in recognition of the land owner; Isaak Cox.

Sprayfield Operation

Process wastewater is applied to the land system year around. The "backbone" of the system consists of approximately 900 acres that is permanently cropped in alfalfa and winter wheat. The BAF fields and some I/C fields generally make up this alfalfa acreage and receive the bulk of the process wastewater loading during the year, especially during the growing season. The remainder of the system (I/C fields) has a variety of crops (wheat, corn, potatoes) that are managed for production agriculture purposes; irrigated with freshwater and fertilized with commercial fertilizer when needed. During the Fall/winter non-growing season, the I/C fields receive most all of the process wastewater loadings.

Sprayfield Design

An engineering report for the system has been submitted to Ecology (CES, 2001b) and the following design values were determined:

1. Nitrogen: Based on the lowest annual nitrogen capacity for the entire site over a 5-year crop rotation, the annual design nitrogen capacity for the site is 477,000 lbs (gross). This compares to an estimated annual processing plant output of 450,000 lbs. It was estimated that approximately 170,500 lbs of nitrogen (38% of total) will be applied to the I/C fields during the non-growing season; November – February.

   The design of the land treatment system included "target" maximum nitrogen loads for the alfalfa fields (440 lbs/acre) and for these fields when they are rotated into wheat, 175 lbs/acre. The target load value for the remaining fields is 175 lbs/acre.

2. Flow: A design annual process wastewater flow of 520 MG was used; 340 MG during the summer growing season (March-October) and 180 MG (35% of total) during the winter non-growing season

3. Water: The annual output of process wastewater will not meet the water demand of the crops. Approximately 1850 MG of supplemental water will be required to meet the total crop demand.

4. Salts: Loading to the site will range from 890 to 3300 lbs/acre (avg = 1700 lbs/acre). Salt loading will be managed using generally accepted agricultural BMPs for leaching to control the soil salinity not to exceed 2 mmhos/cm in the root zone. The average leaching requirement (LR) for the site to control the soil salinity is 7.6% or 4.4 inches. Irrigation will be managed so that the amount of water leached below the root zone (Leaching Fraction, LF) is less than or equal to the leaching requirement; LF $\leq$ LR.

5. BOD: The design value for the BAF fields was determined to be 32.7×10^6 lbs/year. This was determined based on not exceeding a maximum daily load of 100 lbs/acre/day. The current BOD output from the processing facility is approximately 4×10^6 lbs.

Sprayfield Hydraulic Loading

A review of the annual Irrigation and Crop Management Plans (ICMPs) for the sprayfields (2000-2004) showed that the amount of wastewater applied to all fields was far below the amount required by the crops (SoilTest, 2004; 2005). Using 2004 as an example, wastewater provided approximately 29% of the water need for the alfalfa fields and approximately 8% for the I/C fields.

The 2001 engineering report determined the proportional annual hydraulic loading for the site: 18% from process wastewater; 20% from precipitation; 62% supplemental fresh (ground) water.

Information received from the Permittee during the public comment period revealed that the processing facility has implemented a water-use reduction plan that has resulted in a 35% reduction in the amount of process water applied to the fields from that used during the last permit cycle.

Sprayfield Nitrogen Loading

Gross nitrogen load and balance information in the annual ICMPs for the entire site (BAF and I/C fields) were reviewed.

	Avg. alfalfa field load (lbs/acre)	Avg. alfalfa field uptake (lbs/acre)	Avg. I/C field load [1] (lbs/acre)	Avg I/C field uptake (lbs/acre)
2000	245	252	Not reported	Not reported
2001	198	364	87	Not reported
2002	190	425	52	Not reported
2003	190	428	68	Not reported

2004	142	484	40	178
[1] values do not include loads from commercial fertilizers or supplemental water				

Wastewater nitrogen load values for the alfalfa and I/C fields have been well below the design target maximum values; 440 and 150 lbs/acre, respectively. Nitrogen uptake by the alfalfa was generally greater than the amount of nitrogen applied to the fields. Nitrogen uptake and balance information was not reported for the other I/C fields until 2004.

In contrast to the wastewater loadings to the I/C fields, the commercial fertilizer nitrogen loading to these fields has been substantially greater than the wastewater loads. Information in the 2003 and 2004 ICMPs shows that the commercial fertilizer load values ranged from 116 to 331 lbs/acre, with the averages being 206 and 235 lbs/acre, respectively. Both values exceed the target load value determined by BAF for the I/C fields. In addition, the nitrogen contribution by the supplemental irrigation water has not been reported.

Information received from the Permittee during the public comment period revealed that nitrogen loading to the sprayfield site during the last permit cycle was approximately 50% less than the design load; 450,000 lbs. A review of the total annual nitrogen production reported in the annual irrigation and crop plans for 2000-2004 confirmed this.

Sprayfield Total Dissolved Salt Loading

Values for TDS loading are only available for two years:

2003: alfalfa fields – 1555 to 2172 lbs/acre
I/C fields – 14 to 1256 lbs/acre

2004: alfalfa fields – 1280 to 1780 lbs/acre
I/C fields – 30 to 2150 lbs/acre

These load values do not include salts contributed by the supplemental irrigation water or any commercial fertilizers that were applied.

The salt load values appear to be comparable to other potato and vegetable processors that use land treatment systems in eastern Washington; salt loading generally exceeds the crop requirements. The amount of land that would be needed for the crops to utilize the amount of salt that is applied (treatment) would be cost prohibitive to bring online and operate. As described in the engineering report for the site, irrigation BMPs are used to manage the salt load by leaching only that amount that is necessary to maintain good crop production; leaching fraction $\leq$ leaching requirement.

Water Balance Model Risk Assessment

In response to Ecology's concerns about the ability of BAF's year around application of wastewater to protect the ground water, especially during the winter non-growing season, BAF submitted an addendum to the engineering report that evaluated the risk of ground water impact from year around application vs. seasonal storage during the winter non-growing season; CES, 2003.

A water balance model was used to estimate the percent of total soil profile nitrate-nitrogen that would be in the percolate from the root zone for two irrigation scenarios: during the winter period (November – February) for year around, and from the site using storage during the winter non-growing season.

The model results showed:

1. When leaching was done in the fall (November), nitrate loss in the percolate was the same, on average, for both the year around and seasonal storage scenarios.
2. When leaching was done in the winter (February), nitrate loss was 2 8% higher for the year around irrigation scenario than for winter storage.

Several statistical tools were used to determine whether the difference in winter leaching was significant. The Students-T test for paired means was used for the following null hypothesis:

H_o: Year-around percolate nitrate loss minus winter storage nitrate loss = 0
H_A: Year-around percolate nitrate loss minus winter storage nitrate loss > 0

It was determined that the probability that there is no difference in nitrate percolate loss between the year around and winter storage irrigation scenario is near 100%. The hypothesis that the average percolate nitrate loss from year around irrigation is not different from that for the winter storage scenario is strongly supported; accept H_o. The risk to ground water from nitrate leached during year around application is the same as that for irrigating only during the growing season with winter storage.

GROUND WATER

A description and analysis of the geology and ground water beneath the sprayfield site was presented in a hydrogeologic report (CES, 2001a) and in Attachment G5 to the permit application. The site is underlain by basalt and the surface soils are comprised of glacio-fluvial dune sands and gravels.

There are two aquifer types at the sprayfield site: an overburden porous aquifer and a deeper fractured basalt aquifer. The deeper basalt aquifer is the most significant water bearing zone and is where most all irrigation wells are completed. Given the large amount of water that is pumped throughout the area for irrigation, the water level in both systems fluctuates with levels rising in the winter and falling in the summer, the most dramatic fluctuations occur in the basalt aquifer.

The porous sandy soils and proximity of the site to the Potholes Reservoir has resulted in a hydraulic continuity between the ground water and the reservoir. Ground water flow is to the southwest (Fig. 3) towards the reservoir.

Moses Lake POTW

The city of Moses Lake owns and operates a sanitary wastewater treatment system located at the northeast corner of the sprayfield site; Fig. 2. The "Dunes" facility was constructed in 1984 and consists of aeration and settling lagoons with final discharge to rapid infiltration basins. The facility is permitted for 2 5 MGD.

The city is in the final stages of completing an upgrade to an extended aeration system with UV disinfection, and discharge to infiltration basins. The system was designed to produce an effluent with a maximum daily TN and nitrate concentration of 10 and 6 mg/L (as N), respectively, and an average monthly $CBOD_5$ (carbonaceous biochemical oxygen demand) of 15 mg/L. The average monthly design flow is 3.71 MGD.

MODFLOW modeling

The HG report evaluated seasonal steady-state ground water flow (summer and winter) using MODFLOW. Results showed the following:

1. A plume of nitrate impacted ground water extends in a S-SW direction across the sprayfield site from the old BAF field site and Dunes POTW; Fig. 4 and 5. The extent of the plume depends on the season; winter or summer.
2. The 17 irrigation wells at the site capture 99.9% of the impacted ground water traveling beneath the site in the summer.
3. Approximately 467 MG of percolate loss enters the ground water beneath the sprayfield site in the winter.
4. The velocity and volume of the ground water beneath the site significantly reduces in the winter.
5. MW1, 2, 3, and 12 represent upgradient conditions.

Ground Water Quality

The HG report analyzed trends in the ground water database for samples collected from BAF's 10 monitoring wells located throughout the sprayfield site (Fig. 2). The current wells were installed over a three year period; 1994-97. All were generally completed in the upper aquifer (sand) and range in depth from 35 to 80ft. The data analysis was for the period 1994 through 2000. Based on this review the report concluded:

1. Past agriculture practices used for the I/C fields have impacted ground water.
2. The discharge from the city of Moses Lake Dunes POTW has impacted the ground water upgradient of the sprayfield site.
3. The original 206 acre sprayfield site has impacted the shallow ground water aquifer.
4. The land leveling and soil disturbance associated with the reconstruction of the old BAF fields and construction of the current fields caused nitrates to be generated from stored nitrogen (via nitrification) in the soils and be released to the ground water.

Upgradient (Background) Ground Water Quality

Ground water monitoring data for the period January 2001 – May 2005 for the site's four upgradient wells (Addendum 1) was used to estimate the upgradient (background) ground water quality for BAF's sprayfield site. The wells (MW-1, -2, -3, and -12; Fig. 2) were identified in the 2001 HG report as being representative of upgradient conditions.

The statistical method described in Ecology's ground water implementation guidance was used to estimate background values (95% upper tolerance limit; UTL. Ecology, 1996). The analysis included an evaluation of outliers, seasonality, and a trend analysis. A description of the analysis is in Appendix C. A graphical presentation of the statistical analysis is shown in Addendum 2.

The UTL (background ground water quality) values for the site are:

	MW1	MW2	MW3	MW12
NO_3	2.5 mg/L	14 mg/L	7.3 mg/L	7.8 mg/L
TDS	212 mg/L	651 mg/L	615 mg/L	423 mg/L

MW-1

Nitrate: Based on seasonality adjusted values, there was a significant decreasing trend in the data set; n = 53. To eliminate the decreasing trend, all data for Jan 01-Mar 02 were eliminated from the analysis. The remaining data set (n=38) was used for determining the background nitrate value; 2.5 mg/L.

TDS: Seasonality and a decreasing trend were also found for the TDS data set. The background value (212 mg/L) is based on the Aug 03-May 05 data set; n = 22.

MW-2

Nitrate: There was a significant decreasing trend in the data set. All data for Jan 01-May 03 were removed to eliminate the trend. The background value (14 mg/L) is based on June 03-May 05 data; n = 10.

TDS: After the removal of outlier values (April 04) from the data set, there was a significant decreasing trend in data set. Data for Jan 01-Mar 04 was removed to eliminate the trend and the outlier Oct. 04 data point was removed. The background value (651 mg/L) is based on the April 04-May 05 data; n = 7.

MW-3

Nitrate: The data set (n=19) was insufficient to test for seasonality because, in part, there was insufficient well volume to sample. There was no significant trend in the data set.

TDS: There was a significant decreasing trend in the data. The background value is based on April -1-May 05 data; n = 16.

MW-12

Nitrate: After the removal of outlier values (Aug 01 and Aug 03), there as no seasonality or trend in the data set; n = 50.

TDS: There was a significant decreasing trend in the data set After the removal of the Jan 01 – April 03 data, and then the removal of the July 03 outlier, the background value is based on the May 03-May 05 no-trend data; n = 24

The only background value to exceed the nitrate standard (10 mg/L) occurred at MW-2, which is along the eastern periphery of the original 206 acre sprayfield and downgradient of the Dunes POTW. The background TDS values at MW-2 and -3 exceeded the ground water standard; 500 mg/L.

In general, the nitrate and TDS ground water data sets (Jan 01 – May 05) showed a significant decreasing trend (at 96% C.I.) at each upgradient well. As explained in Appendix C, data values were progressively eliminated (earliest to latest) until no trend was found; this data set was used to determine the UTL. The smallest data set used for the background was for TDS at MW-2; n = 7. A decreasing trend in the ground water data at the upgradient wells was also found for the January 1996 – December 2001 ground water data when background values were determined in the Fact Sheet for the current permit that was issued in 2000.

Downgradient Ground Water Quality

Ground water nitrate and TDS data for the down gradient wells (MW6, 8, 9, 10, 11, and 13) for the period 1996/97 through May 2005 was analyzed for trends (Addendum 3). Regression lines were determined from the data and the significance of the trends was determined using the Sen's slope estimator.

MW-6:

This well is located closest to the original 206 acre sprayfield site that was heavily loaded with wastewater for 25 years; Fig. 2. Nitrate values have significantly increased since 1996. Seasonal peaks appeared to occur in the winter (January) and the lowest values occurred in the Spring (May). Values for TDS also showed a significant increase. Values for both parameters greatly exceed their respective ground water standard values.

MW-8:

Nitrate values have significantly declined since 1997 while values for TDS have remained relatively unchanged. This well is located farther downstream of the original sprayfield site and somewhat outside of the nitrate plume; Fig. 4.

MW9:

This well is located along the southern periphery of the site and also somewhat outside of the nitrate plume; Fig. 4. Nitrate values have significantly increased since November 1997. Values for TDS have shown some seasonal spikes in excess of the ground water standard (500 mg/L), but have not showed a significant trend in either direction.

MW10:

This well is located at the most southern extent of the sprayfield site; Fig2. Values for both nitrate and TDS appear to show a slight increase but neither are significant. The increase may be due to the approaching nitrate plume; Fig. 4.

MW11:

This well is located along the western boundary of the sprayfield site and well outside of the nitrate plume. The analysis for the nitrate data shows an increasing regression line, but a slight decreasing trend. Ground water TDS concentrations at the well show a significant decreasing trend.

MW13:

This well is located within the boundaries of the sprayfield site and along the westerly edge of the nitrate plume. Nitrate values sharply increased from November 1997 to 2002. Thereafter, values began to decline and have continued in a significant trend to May 2005. Values for TDS show a similar pattern of increase from November 1997 to 2002, but the decline since 2002 has not been significant.

Nitrate and TDS concentrations in the groundwater immediately downgradient of the original 206 acre sprayfield site continue to increase in a significant manner. Nitrate and TDS in the downgradient wells along the western and southern boundary of the site appear to be declining or unchanging.

For the downgradient wells along the eastern boundary of the site, nitrate concentrations in the ground water appear to be increasing and TDS values remaining relatively constant.

STORMWATER

A Stormwater Runoff Plan has been prepared by BAF and was included with the permit application. Runoff from areas of the processing facility site discharges to different locations, and include the Rocky Coulee, and onsite natural pond, along the southern boundary of the site, and to an onsite stormwater pond. Water collected in the stormwater pond is either evaporated or pumped to the sprayfields. The facility does not have a state issued baseline stormwater permit.

TECHNICAL REVIEW

State law requires that all dischargers must apply AKART (all known available and reasonable methods of treatment, prevention, and control) to their wastewater prior to discharge to waters of the state. AKART for a discharger is generally described in an engineering report that is approved by Ecology. Ecology recently adopted guidance that, in part, describes what the Department has approved as AKART for land treatment systems (Ecology, 2005). To reliably protect ground water, the guidance requires, in part, that wastewater generated during the winter non-growing season be stored in an approved lined impoundment.

The guidance does allow a site specific demonstration of innovative approaches to land treatment systems that depart from what has been approved. Ecology will allow these new treatment methods so long as they can show a demonstrated equivalent level of protection of the ground water to what has been approved as AKART.

BAF has submitted to Ecology sprayfield design, hydrogeologic and ground water modeling information, as well as a risk analysis in an attempt to show for their sprayfield site that year around application of wastewater is equally protective of the ground water beneath the site as that would be provided by winter storage; AKART.

To assist Ecology in determining whether the current year around land treatment system is AKART and protective of the ground water, it was decided to have a third party review the BAF reports. An interagency agreement was entered into between Ecology and Washington State University (Biological Systems Engineering Dept.) to review the engineering and hydrogeologic reports. The review was to determine, in part, if AKART is provided by BAF's year-around land treatment system.

BAF and its consultant graciously provided WSU with all of the necessary ground water and model input data that were used in the HG and modeling analysis (CES, 2001a). A final technical report has been submitted (WSU, 2005). The review was done in three parts: 1) engineering report; 2) ground water modeling and quality analysis; 3) ground water model re-run.

Engineering Report

The review did not include an evaluation of the design nitrogen load to the fields because the design did not consider any nitrogen loses via volatilization and denitrification. The design gross nitrogen load from the processing facility (450,000 lbs/yr) is less than the treatment capacity of the sprayfield (477,000 lbs), therefore excess nitrogen loading should not be an issue.

The reviewers did note that the sprayfield soils have a low cation exchange capacity (CEC), and that the application of the wastewater with high NH_4^+ and potassium concentrations could overcome the CEC of the soils and increase the potential of NH_4^+ leaching into the ground water.

The reviewers also suggested that wastewater should not be applied in the late Spring. As soil temperatures increase so does the nitrification of the soil-stored NH_4^+. Crop growth is still somewhat limited in the Spring and the potential for leaching nitrates and soluble salts into the ground water is high.

The following recommendations were made:

1. add soil pH testing to the site's monitoring requirements
2. add NH_4^+ testing in the ground water
3. modify the soil sampling to include sampling at the 0.5 and 1.5ft depths, and to increase the frequency of the nitrate soil sampling.

Hydrogeologic Report

The two main parts of the HG report for the sprayfield site were reviewed; MODFLOW modeling and ground water quality analysis.

A. It was the reviewer's opinion that the setup of the MODFLOW model was problematic, and resulted in unsupported conclusions about the ground water beneath the sprayfield site. The most notable was that 99.9% of the ground water is captured by the irrigation wells during the summer. The reviewers re-visited the source and sink terms in the ground water balance and determined that approximately 36% of the ground water is captured. This new value was supported by re-running the MODPATH (particle tracking) portion of the model which showed that the irrigation wells had less of an impact on ground water capture. **(NOTE: Please see the "Response to Comments" section to see BAF's explanation of the 99.9% value; comment #12)**

B. The review of the up- and downgradient well data appeared to indicate that the BAF and I/C fields that were brought on-line after 1997 have added to the nitrate and chloride plume that extends from the old BAF field site. The ground water database does not allow the determination if the impacts are from summer or winter applications, or if the source of nitrogen is from the wastewater or commercial fertilizer.

MODFLOW model re-run

The reviewers revised the settings and re-ran the MODFLOW ground water model. Four runs were made: runs 1-3 were under steady-state flow but transient solute transport; run 4 was under transient flow and solute transport. Results of the model re-run confirmed that the BAF sprayfields is the single most significant contributor of chlorides and nitrates to the pollutant plume that extends across the site from the original BAF sprayfields. Additional monitoring is needed (i.e., vadose zone) to determine if winter and/or summer applications of wastewater is causing the leaching of nitrates to the ground water.

Conclusions

The technical report concluded that:

1. The overall ground water quality has been adversely impacted by the BAF sprayfields
2. It is difficult to evaluate the BAF land treatment system as AKART
3. It is not certain that the land treatment system is appropriate for the existing and future beneficial uses of the ground water in terms of nitrate concentration according to the state's water quality standards (WAC 173-200).

(NOTE: BAF has informed Ecology of its intent to rebut the allegations of the independent review. Also, please see the "Response to Comments" section of this Fact Sheet to read BAF's statement regarding spring-time nitrate leaching potential and their summary statement about WSU's conclusions; comment #9)

PERMIT STATUS

The previous permit for this facility was issued on November 1, 2000.

An application for permit renewal was submitted to the Department on May 10, 2005

SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT

During the history of the previous permit, the Permittee has generally remained in compliance based on Discharge Monitoring Reports (DMRs) and other reports submitted to the Department and inspections conducted by the Department.

The only non-compliance issue has been not reporting all of the information required in the annual irrigation and crop management plan. Specifically, estimated water, nutrient and salt balances for the I/C fields, and salt balances for the BAF fields. The only year that the Permittee fully reported the nutrient and salt balance information for all of the I/C fields was for 2004.

WASTEWATER CHARACTERIZATION

The concentration of pollutants in the discharge was reported in the permit application and in discharge monitoring reports. The proposed wastewater discharge prior to spray irrigation is characterized for the following parameters as given in the permit application from 24hr composite samples:

Table 1: Wastewater Characterization

Parameter	Concentration
BOD_5	Range: 4-984 mg/L; Avg = 683 mg/L
Ammonia-N	Range: 0-41mg/L; Avg = 25 5 mg/L
pH	Range: 6 3 – 7 2 s u
Total Kjeldahl Nitrogen	Range: 0-80 mg/L; Avg = 52 5
Total Phosphate (as P)	Range: 6 5-16 2 mg/L; Avg = 12 1 mg/L
Calcium	Range: 7-9 8 mg/L; Avg = 8 4 mg/L
Chloride	Range: 79 4-146 mg/L; Avg = 119 mg/L
Bicarbonate	Range: 352-504 mg/L; Avg = 430 mg/L
Magnesium	Range: 5 3-8 6 mg/L; Avg = 7 5 mg/L
Potassium	Range: 82 3-185 mg/L; Avg = 143 mg/L
Sodium	Range: 121-177 mg/L; Avg = 140 mg/L
Sulfate	Range: 6.1-25 mg/L; Avg. = 15.8 mg/L

The organic strength of the BAF wastewater appears to be less than that from french fry-type potato processors that are more common in the area The average BOD values for these process wastewaters are generally in the range of 1000 to 1500 mg/L The lower organic strength of the BAF wastewater could be due to: a less intensive peeling process; not using fry oil in the process; and, much less intensive slicing and cutting of the potato than a fry plant.

Another difference in the BAF wastewater is the average TKN concentration; it is about one-half to one-third that for a french fry facility. The lower TKN concentration may be related to the lower organic concentration.

PROPOSED PERMIT LIMITATIONS

State regulations require that limitations set forth in a waste discharge permit must be either technology- or water quality-based. Wastewater must be treated using all known, available, and reasonable treatment (AKART) and not pollute the waters of the State. The minimum requirements to demonstrate compliance with the AKART standard were determined in the engineering reports (CES, 2001; 2003), in conformance with *Guidelines for the Preparation of Engineering Reports for Industrial Wastewater Land Application Systems*, May 1993.

The permit also includes limitations on the quantity and quality of the wastewater applied to the sprayfield that have been determined to protect the quality of the ground water. The approved engineering report includes specific design criteria for this facility. Water quality-based

limitations are based upon compliance with the Ground Water Quality Standards (Chapter 173-200 WAC).

The more stringent of the water quality-based or technology-based limits are applied to each of the parameters of concern. Each of these types of limits is described in more detail below.

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

All waste discharge permits issued by the Department must specify conditions requiring available and reasonable methods of prevention, control, and treatment of discharges to waters of the state (WAC 173-216-110). The following permit limitations are necessary to satisfy the requirement for AKART:

1. Wastewater shall be land applied via spray irrigation not to exceed agronomic rates (as defined in the Department's ground water implementation guidance) for total nitrogen and water, and at rates for other wastewater constituents that are protective of background ground water quality.
2. Total nitrogen and water shall be applied to the sprayfields not to exceed the design values given in the November 2001 engineering report for the site.
3. The system must be operated so as to protect the existing and future beneficial uses of the ground water and not cause a violation of the ground water standards.
4. The wastewater flow to the fields shall not exceed 520 million gallons per year.
5. The gross nitrogen load to the sprayfield site shall not exceed 477,000 lbs per year.
6. Crop specific gross nitrogen loading shall be limited to:
    a. Alfalfa: 440 lbs/acre
    b. Winter wheat: 175 lbs/acre
    c. I/C fields: 150 lbs/acre
7. The leaching fraction for the site shall not exceed 7.6% (4.4 inches).
8. Whenever leaching is planned to control soil salinity, the leaching requirement shall be met using precipitation and/or fresh irrigation water.
9. The BOD load to the fields shall not exceed 100 lbs/acre/day.

GROUND WATER QUALITY-BASED EFFLUENT LIMITATIONS

In order to protect existing water quality and preserve the designated beneficial uses of Washington's ground waters including the protection of human health, WAC 173-200-100 states that waste discharge permits shall be conditioned in such a manner as to authorize only activities that will not cause violations of the Ground Water Quality Standards. The goal of the ground water quality standards is to maintain the highest quality of the State's ground waters and to protect existing and future beneficial uses of the ground water through the reduction or

elimination of the discharge of contaminants to ground water [WAC 173-200-010(4)]. This goal is achieved by [GW Implementation Guidance, Abstract, page x]:

1. Requiring that AKART (all known available and reasonable methods of prevention, control and treatment) be applied to any discharge;

2. Application of the antidegradation policy of the ground water quality standards. This policy mandates protecting background water quality and preventing degradation of water quality which would harm a beneficial use or violate the ground water standards; and

3. Establishing numeric and narrative criteria for the protection of human health and welfare in the ground water quality standards.

Applicable ground water criteria as defined in Chapter 173-200 WAC and in RCW 90.48.520 for this discharge include the following:

Table 2: Ground Water Quality Criteria

Total Dissolved Solids	500 mg/L
Nitrate	10 mg/L

Enforcement Limits

Several factors make it difficult to use the estimated background ground water quality values to establish ground water enforcement limits for the entire BAF sprayfield site:

1. Ground water modeling (CES, 2001a) shows that a plume of nitrate rich ground water extends from the old original BAF sprayfield site to near the southern boundary of the site (Fig. 4 & 5). The extent of the plume changes with the season because of the affects of pumping from the irrigation wells. Most of the downgradient wells that would be used for compliance with the enforcement limits are completed within the plume. Nitrate concentrations in these wells are high. The average values for MW6, 9, 10, and 13 range from 32.8 – 52.5 mg/L. Using these wells for compliance with the enforcement limits would result in BAF being in immediate non-compliance when the permit is issued. The northwestern and western sprayfields are the only sites not above the plume throughout the year.

2. Establishing enforcement limits for nitrate and TDS at MW-11 for the western sprayfields would cause the permittee to be in immediate non-compliance for both parameters. Values for nitrate at MW-11 have ranged from 13.5 to 52.4 mg/L (January 2001 – May 2005), and values for TDS ranged from 472 to 787 mg/L. These compare to the background (enforcement) values of 7.8 mg/L for nitrate and 423 mg/L for TDS.

   The HG report (CES, 2001a) concluded that elevated nitrate and chloride values at MW-11 were from commercial fertilizers and not the wastewater. This was based on the short time the I/C fields, upgradient from MW-11, have been used for wastewater treatment (1998) and that the application volumes have been low.

3. The upgradient background values at MW-1, -2, and -3 are based on relatively small data sets. While the number of values meets Ecology's guidance minimum for background determination (n = 8), it must be remembered that the small data sets are a part of an overall decreasing trend for the entire data base for both nitrate and TDS.

4 The background values determined for this Fact Sheet are less than those determined in the Fact Sheet for the current permit (issued 2000). This reflects the general decreasing trend in ground water concentrations at the upgradient wells for nitrate and TDS.

2000 permit:

	MW1	MW2	MW3	MW12
NO_3	11.2 mg/L	17.8 mg/L	22.3 mg/L	13.2 mg/L
TDS	293 mg/L	747 mg/L	675 mg/L	515 mg/L

Proposed permit:

	MW1	MW2	MW3	MW12
NO_3	2.5 mg/L	14 mg/L	7.3 mg/L	7.8 mg/L
TDS	212 mg/L	651 mg/L	615 mg/L	423 mg/L

Given the modeling and ground water quality information that has been presented and discussed in the HG report (CES, 2001a), and data that has been submitted to Ecology, it has been decided that enforcement limits will not put in the proposed permit. Enforcement limits will be revisited when the next permit is issued.

Instead of enforcement limits, changes will be required in the management of the sprayfield site and the sprayfield reporting requirements in the permit. These changes will be based, in part, on suggested monitoring and compliance recommendations developed by BAF for their site (CES, 2003).

COMPARISON OF LIMITATIONS WITH THE EXISTING PERMIT ISSUED NOVEMBER 1, 2000

Table 3: Comparison of Previous and New Limits

Parameter	Existing Limits	Proposed Limits
annual avg. flow applied to irrigation lands	1.35 MGD	1.42 MGD
maximum monthly average flow to irrigation lands	1.66 MGD	1.66 MGD

Total annual wastewater flow from processing facility	********	520 MG

The change in the annual average flow limit is based on the total annual flow sprayfield design capacity value that was described in the engineering report (CES, 2001b), and on information presented in the permit application.

MONITORING REQUIREMENTS

Monitoring, recording, and reporting are specified to verify that the treatment process is functioning correctly, that ground water criteria are not violated, and that effluent limitations are being achieved (WAC 173-216-110).

MONITORING

The monitoring schedule is detailed in the proposed permit under Condition S2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring.

IRRIGATED PROCESS WASTEWATER MONITORING

The testing requirements that are in the current permit for the process wastewater irrigated onto the sprayfields will be rolled over into the proposed permit. "Fixed dissolved solids" testing will be added to the test parameter list. This will provide data that will give a better understanding of the inorganic salt load to the fields.

Testing for the list of cations and anions will be decreased from quarterly to twice per year. Quarterly testing has been required for the past two permit cycles and a reduction in sampling has been determined to be warranted.

A concern of Ecology relative to the year around application of wastewater has been whether the Spring-time mineralization of organic nitrogen stored in the root zone over the winter and the subsequent conversion of ammonia to nitrate via nitrification coincides with the crop's uptake requirements for nitrogen as soil and air temperatures increase. Soluble wastewater organics have the potential to percolate deeper into the root zone and cause mineralized and nitrified nitrogen (nitrate) to be less available to early crop growth and a higher potential to leach to the ground water.

In addition, the mineralization of the soluble organics produces organic acids which can cause the weathering of the soils and the release of salts such as calcium and magnesium. These can be leached out of the soil column and add to the TDS concentration in the ground water.

To gain a better understanding of the organic load to the sprayfields, soluble BOD testing of the irrigated wastewater will be required for one year. The results of both soluble and total BOD testing for the year will be presented to Ecology in a report.

FRESH IRRIGATION WATER MONITORING

The annual Irrigation and Crop Management Plan (ICM Plan) requires, in part, that nutrient, salt, and hydraulic loadings from the supplemental irrigation water be accounted for in the calculated nutrient, salt and water balances for each sprayfield. This is especially important for the I/C fields which receive most of their irrigation requirements from the onsite wells. Information in the 2003-04 ICM Plan showed that approximately 28.4 x 10^9 gallons of freshwater was applied to the I/C fields, with an average application rate of 28 inches/acre.

To provide the data from which to calculate the freshwater loading to all fields, the permit will require some testing of the fresh irrigation water at each of the 17 wells. Testing will be for pH, ammonia, nitrate, and total dissolved solids. Ammonia and TDS will be done instead of TKN and fixed dissolved solids because of the near absence of organics in the ground water.

Testing will be done only once during the permit cycle; 2006. The single test values will be used to account for freshwater loadings in all annual irrigation and crop plans during this permit cycle.

CROP MONITORING

Crop monitoring was a requirement in the last permit and will be continued in the proposed permit. Reporting of the test results will be done in the annual irrigation and crop management plan. The data will be used to develop a nutrient, water and salt budget for the fields.

The list of cations and anions will be replaced with "ash weight" (mg/Kg, dry wt). The ash weight will provide an estimate of the total inorganic salt content of the plant tissue. This information will provide an estimate of the fixed dissolved solids uptake by the crop and allow for the determination of a dissolved solids balance for the sprayfields.

Crop sample collection for testing will be required for all grain/grass-type of crops (alfalfa; wheat; mint, etc.). Samples will be collected in a manner that best represents the uptake for each crop. These values will be used in the determination of the end-of-year nitrogen/nutrient, and water balance reporting requirements. For non-forage type crops (e.g., corn, potatoes), the use of literature values for nitrogen/nutrient uptake that are applicable to the area will be acceptable.

SOIL MONITORING

The current permit requires twice per year soil testing (beginning and end of crop season) for all BAF (alfalfa) fields and some selected I/C fields (#7, #10, #14). The testing includes a list of different soil parameters. A monitoring plan was subsequently developed by BAF (CES, 2003) that suggested the soils in all fields be monitored only for nitrate and salinity, and that the soil water profile be measured at least weekly on representative fields for each crop. The plan also suggested that a running, three year end-of-crop-year soil profile nitrate be generated, and that the fields be operated so there is a stable or decreasing trend.

It is understood that the I/C fields receive much less wastewater than do the BAF (alfalfa/wheat) fields that make up the backbone of the land treatment site. But, the small hydraulic load and nutrients supplied by the wastewater to the I/C fields must be supplemented by the addition of a large amount of freshwater and some commercial fertilizer to meet the crop demands.

Ecology believes that soil monitoring for this site is an extremely important irrigation and crop management tool, given the moderate depth to the ground water and the sandy well-drained soils. It has been decided that to account for the nutrients applied to the fields, the following soil testing will be required.

1. The soil testing requirements in the current permit will be continued for the BAF fields (alfalfa/wheat fields) and selected I/C fields but with some changes:

    a. Cation exchange capacity (CEC) will replace "soil moisture" because the moisture content changes continuously and a one time sample, twice per year gives limited long-term information.

    b. pH, "organic matter", TKN, and "cation exchange capacity" testing will be done at several near surface soil depths instead of the entire 1-8ft root depth. It is intended that this information can be used to verify the nitrogen volatilization loss rate for the site and potential NH_4^+ loss via leaching.

    c. The total soil testing depth will be reduced from 8 to 6 feet. Chemical parameters that leach beyond this depth can generally be regarded as lost from root capture and plant uptake.

BAF's sprayfield monitoring plan (CES, 2003) recommends sampling and testing soils in all fields for residual nitrate and salinity. In lieu of this testing, the permit will require the submittal of a vadose zone monitoring plan that will include the sampling of soil percolate from the BAF fields and selected I/C fields

(NOTE: please see the Response to Comments section for changes that were made to the soil testing in response to BAF's comments on the draft permit; comment #34)

GROUND WATER MONITORING

Ground water monitoring in the current permit will be continued in the proposed permit. The testing for the list of cations and anions will be changed from "quarterly" to "once per year"

Ammonium ion testing (NH_4^+) will be added to the list of test parameters. As explained in WSU's technical evaluation report, the land application of relatively high levels of potassium in the process wastewater has the potential of exceeding the CEC of the soils and allowing ammonium nitrogen to leach to the ground water.

It is recognized that there is no ground water criteria for ammonium, but comparing up and downgradient well values offers insight into the impacts of applying high potassium wastewater onto well drained soils and with a moderate depth to ground water

Sulfate testing will be added for a more complete list of the anion and cation test parameters. In addition, the field test for the presence/absence of ferrous iron will be added. This simple colorimetric test determines the presence of reducing conditions in the ground water that could be caused by breakdown of organics that have leached to the ground water. These test results will compliment the soluble BOD testing of the irrigated wastewater.

VADOSE ZONE MONITORING

As explained previously, BAF has evaluated the risk to ground water from their current year around land treatment system (CES, 2003). Risk was based on the estimated percent of total soil profile nitrate that would be leached to the ground water during the fall and late-winter.

In an effort to "ground truth" the results of the risk assessment modeling and get information on wastewater infiltration through the vadose zone and in lieu of soils testing at all fields, the permit will require BAF to submit a plan for the installation of a vadose monitoring system for the BAF site. The system will be designed to collect soil water at the base of the root zone in the BAF and I/C fields. Parameters of interest include: nitrate, ammonium, dissolved salts, potassium, and pH.

The plan will include a description of the O&M for the collection system that includes sample collection and preservation, and testing. A sampling schedule shall also be developed that includes the determination of the "% loss of residual soil nitrate", the concentration of nitrate and chloride in the leachate, and the volume of water leached. These values can be compared to the values estimated in the risk analysis, and those estimated by the ground water model.

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The conditions of S3 are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-216-110).

FACILITY LOADING

The design criteria for this treatment facility are taken from the engineering reports prepared by BAF and are as follows:

Average daily flow from the processing facility	1.42 mgd
Total annual process wastewater flow	520 MG
Total annual (gross) nitrogen load from processing facility [1]	477,000 lbs
Total annual BOD_5 load to BAF fields from processing facility	32.7×10^6 lbs

[1] For testing and reporting purposes, TN = TKN, because of the near absence of nitrate-N in the wastewater.

The permit requires the Permittee to maintain adequate capacity to treat the flows and waste loading to the treatment plant (WAC 173-216-110[4]). For significant changes in loadings to the treatment works, the permit requires a new application and an engineering report (WAC 173-216-110[5]).

IRRIGATION AND CROP MANAGEMENT PLAN

The submittal of an annual Irrigation and Crop Management Plan (ICM Plan) will continue. It is required to, in part, support the engineering report(s). This plan shall include a consideration of

wastewater application at agronomic rates, and should describe and evaluate various irrigation controls.

BAF has proposed to prepare and submit field specific nutrient and water balances for those fields that receive more than 2 inches of process wastewater or any field where excess irrigation water is added for leaching purposes (CES, 2003). No rationale was given for the 2 inch limit, except that 2 inches of process wastewater applies approximately 32lbs of N.

Generally, it is Ecology's position that if any wastewater is applied to a field, then a nutrient and water balance must be determined and presented in the ICM Plan. For sites that apply "small" amounts of wastewater to the fields on an infrequent basis, Ecology has guidance for the *de minimis* application of wastewater. The annual scheduled use for most of the I/C fields to receive wastewater during the winter months would not appear to meet the requirements for a *de minimis* application.

Based on the monitoring information for the wastewater and fresh irrigation water, the commercial fertilizer applications, and crop monitoring data the ICM Plan will:

1. Summarize the operations of the entire treatment site (BAF fields and all I/C fields) for the previous year and describe the operations for the upcoming year relative to wastewater, fertilizer, and supplemental water loadings (e.g., nitrogen, salt, and water loadings) based on the chosen crop rotation.

2. Compare the nitrogen loadings to each field (wastewater + fertilizer + supplemental water) with the design values given in the engineering report (CES, 2001b), and the estimated loads presented in the previous year's ICM Plan.

3. Develop a water budget for each field to include hydraulic loads from the wastewater, supplemental water, and precipitation. Determine the leaching fraction for each field and compare the values to the design leaching requirement; 7.6% or 4.4 inches (CES, 2001b)

4. Develop a salt budget for each field. Salt loadings to each field shall include loads from the wastewater, fertilizer, and supplemental water.

    a. The report shall determine the need and describe any planned leaching to control soil salinity.

5. Report all crop and soil testing results.

    a. Present at least a running three year end-of-crop-year soil profile nitrate and salinity graph for each field to show the trend in values.

The monitoring plan submitted by BAF recommends that freshwater flows to the I/C fields be estimated. Ecology does not agree with the estimation of flows to any field and agrees with BAF's farm consultant that meter readings need to be collected to more accurately monitor hydraulic loadings to the non-alfalfa fields (Soiltest, 2005). The sprayfield system represents the wastewater treatment facility for BAF's processing facility and loads based on estimated flows is not sufficient to evaluate its level of treatment and operation relative to its design and the protection of the ground water.

The permit will require the development and implementation of a method to measure the flow of wastewater and supplemental water to every field.

The requirement to describe the total nutrient and water loading to every field is supported by:

1. The authorization of Section S1 of the permit to apply wastewater to all fields "..for final treatment.". All of the fields make up the wastewater treatment system for the BAF facility.
2. The state's water pollution law states it shall be unlawful for any person "..to cause.." pollution of waters of the state; RCW 90.48.080. To insure that BAF is not causing an impact to the ground water beneath the site, the permit requires that all sources of water and nutrients to the site are accounted for and reported.

PETIOLE TESTING

Petiole testing is a technique that chemically analyzes the soluble nutrients in the sap of the leaf stem. It predicts the future growth potential of the plant and provides a "snapshot" of the current state of the soluble nutrient affairs of the plant can guide the farmer in micromanaging the nutrient availability to the plant. If a nutrient is lacking, the farmer can then make decisions on how to correct the deficiency.

The petiole of the plant is a very sensitive indicator of current soil N availability, and management practices such as supplemental N application through irrigation systems (fertigation) allow for corrective measures when deficiencies or excesses are detected.

According to BAF, petiole testing is done weekly by the I/C field farmer to help determine fertilizer applications onto the fields. This fertilization management strategy helps to minimize nitrogen loading to the fields

The annual ICM Plan will include the following relative to petiole testing:

1. A petiole testing plan will be described for each field for the coming year.
2. The ICM Plan will compare the estimated fertilizer nitrogen requirements for each field, as presented in the previous year's ICM Plan, to the actual fertilizer nitrogen loads that were applied based on the petiole test results.

OPERATIONS AND MAINTENANCE

The proposed permit contains condition S.5. as authorized under Chapter 173-240-150 WAC and Chapter 173-216-110 WAC. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment.

BEST MANAGEMENT PRACTICES

BAF developed and submitted several BMPs to reduce the potential impact to the ground water from the year-around application of its wastewater; CES, 2003. These were used to develop a list of BMPs for the permit:

1. A viable and healthy cover crop shall be maintained on all fields that receive wastewater during the winter non-growing season.
2. Annual crops will be followed with deep-rooted alfalfa, wheat, or a perennial crop to maximize the uptake of residual soil nitrate.
3. Adjust irrigation plans during the winter to minimize percolate losses
4. Adjust irrigation plans during high precipitation events to minimize percolate losses.
5. Use irrigation water and/or winter precipitation to meet the leaching requirement.
6. Operate each field so that the three-year running average end-of-crop-year soil profile nitrate concentration is stable or declining.
7. Monitor soil profile water by neutron probe, or equivalent system, on representative fields for each crop, at least weekly. This information will help to better manage irrigation scheduling on crops to promote good yields and minimal nitrogen leaching during the growing season.

FLOW MEASUREMENT – I/C FIELDS

From the information available to Ecology, wastewater and freshwater flows to the I/C fields are estimated values. To insure a better determination of the total annual amount of water and nutrients on these fields, the O&M section of the permit will require the installation of some form of flow measurement to each of the I/C fields. This requirement is supported by BAF's consultant that meter readings are needed to more accurately monitor hydraulic loading to the I/C fields (Soiltest; 2005).

YEAR AROUND LAND APPLICATION

Evaluations that have been made on the effectiveness of BAF's year around land treatment system to protect the ground water beneath the site have been based on statistical and modeling analysis using monitoring data collected by BAF. These types of analytical methods can have varying results depending on the accepted level of uncertainty, assumptions made, and data variability and interpretation. This was evident in comparing the results of the WSU technical review and the information presented to Ecology by BAF

Ecology's recently adopted guidance for land treatment systems (Ecology, 2004) allows for site specific demonstrations of innovative treatment methodologies that depart from what Ecology has approved as AKART. Approval of these methodologies is dependent on their demonstrated ability to equally protect the ground water to what has been previously accepted as AKART for other land treatment systems. A third party review of the available information has raised questions about the level of ground water protection.

The continued operations of the current year around system will depend on the ability of BAF to demonstrate that, using long-term monitoring data and implementing the requirements in this permit, their land treatment site is equally protective of the ground water as that which has been approved by Ecology as AKART. BAF's demonstration will need to be presented in an

addendum to the engineering report for the site. However, additional time must be allowed to implement the requirements in this permit that include:

1. Install a vadose zone monitoring system that will collect leachate from the vadose zone and better explain the fate and transport of nitrogen in the root zone during a time of the year when the potential for leaching is high; Spring
2. Develop and report inclusive nitrogen, salt, and hydraulic load and budget information for each field based on measured flows
3. Implement sprayfield BMPs and determine the affect, if any, on the trend in soil nitrate concentrations and salinity.

It will be determined during the development of the next permit if sufficient information is available to require BAF to submit an engineering report addendum to demonstrate an equivalent level of protection to the ground water as that which has been approved by Ecology to be AKART; i.e., winter storage.

Critical Spring time period

The 2005 technical review report identified the Spring time as a critical period as it related to leaching of nitrates to the ground water. As soil temperatures and moisture increase, denitrification also increases. With the crop demand for nutrients being generally low during the early growing season and wastewater being applied year around the potential for leaching of nitrates and salts to the ground water is high.

It was recommended that the frequency and intensity of soil monitoring during the Spring critical period be increased to better understand " the dynamic characteristics of nitrogen leaching and nitrification events in spring time. ."

It is the intent that the vadose zone monitoring system that is required by the proposed permit will provide information on the quality and quantity of leachate during the critical Spring time period.

Supplemental monitoring

The technical review report (WSU, 2005) could not determine if the nitrates being leached from BAF's sprayfields to the ground water were from the wastewater or commercial fertilizer. A potential way to identify the source of the nitrogen is to use a tracer chemical or parameter. A possible candidate is the use of nitrogen isotopes. Depending on the isotope make-up of each nitrogen source to the ground water (wastewater; fertilizer), the source of the nitrates in the ground water could be found.

Ecology does not have any experience with nitrogen isotope analysis and its application to environmental data analysis. It is recommended that BAF consider this or a similar tracer test procedure in an attempt to determine the source of nitrates and chlorides to the ground water beneath the site.

SOLID WASTE PLAN

A Solid Waste Plan was submitted to Ecology by BAF in March 2001. Approximately $11x10^6$ lbs of potato solids are produced annually which is hauled off –site for cattle feed. Dirt washed from the potatoes (approximately $9x10^6$ lbs/year) is applied onto adjacent lands.

This proposed permit requires, under authority of RCW 90.48.080, that the Permittee develop and submit to the Department a solid waste plan for all process residual wastes stored or managed on and off the processing site. The plan shall describe all measures associated with containment and disposal that will be implemented to prevent solid waste and leachate from discharging into waters of the state; surface and ground water.

SPILL PLAN

A Spill Plan was submitted to Ecology in March 2001 and details some of the spill prevention measures that have been completed. They include: provide secondary containment for sanitary caustic, oils, and solvents; removed a 20,000 gallon diesel tank; sensing devices have been placed on underground diesel lines; spill kits have been purchased

The proposed permit requires the Permittee to review and update this plan and submit it to the Department. The most notable update requirement is the phone number for Ecology

GENERAL CONDITIONS

General Conditions are based directly on state laws and regulations and have been standardized for all industrial waste discharge to ground water permits issued by the Department.

Condition G1 requires responsible officials or their designated representatives to sign submittals to the Department. Condition G2 requires the Permittee to allow the Department to access the treatment system, production facility, and records related to the permit. Condition G3 specifies conditions for modifying, suspending or terminating the permit. Condition G4 requires the Permittee to apply to the Department prior to increasing or varying the discharge from the levels stated in the permit application. Condition G5 requires the Permittee to construct, modify, and operate the permitted facility in accordance with approved engineering documents. Condition G6 prohibits the Permittee from using the permit as a basis for violating any laws, statutes or regulations. Conditions G7 and G8 relate to permit renewal and transfer. Condition G9 requires the payment of permit fees. Condition G10 describes the penalties for violating permit conditions

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to control toxics, and to protect human health and the beneficial uses of waters of the State of Washington. The Department proposes that the permit be issued for five years.

REFERENCES FOR TEXT AND APPENDICES

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Soiltest. 2004. Land Application Annual Report – Crop Year November 2002 through October 2003. April.

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Washington State Department of Ecology, 1993. Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems, Ecology Publication # 93-36. 20 pp.

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Laws and Regulations(http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information (http://www.ecy.wa.gov/programs/wq/wastewater/index.html

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Washington State Department of Ecology. 2004. Guidance on Land Treatment of Nutrients in Wastewater, with Emphasis on Nitrogen. November. Publication No. 04-10-081.

Washington State University. 2005. Report of Technical Review of Basic American Foods/Moses Lake, Wastewater Land Treatment System. November.

APPENDICES

APPENDIX A--PUBLIC INVOLVEMENT INFORMATION

The Department has tentatively determined to reissue a permit to the applicant listed on page one (1) of this fact sheet. The permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

Public notice of application was published on September 12, and 19, 2005 in the Columbia Basin Herald to inform the public that an application had been submitted and to invite comment on the reissuance of this permit.

The Department published a Public Notice of Draft (PNOD) on March 29, 2006 in the Columbia Basin Herald that informed the public that a draft permit and fact sheet were available for review. Interested persons are invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents are available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments should be mailed to:

Water Quality Permit Coordinator
Department of Ecology
4601 North Monroe Street
Spokane, WA 99205-1295

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the thirty (30) day comment period to the address above. The request for a hearing shall indicate the interest of the party and reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-216-100). Public notice regarding any hearing will be circulated at least thirty (30) days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing.

Comments should reference specific text followed by proposed modification or concern when possible. Comments may address technical issues, accuracy and completeness of information, the scope of the facility's proposed coverage, adequacy of environmental protection, permit conditions, or any other concern that would result from issuance of this permit.

The Department will consider all comments received within thirty (30) days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, 509.329.3524, or by writing to the address listed above.

The Fact Sheet and permit were written by Don Nichols.

APPENDIX B--GLOSSARY

Alternate Point of Compliance – May be established at locations some distance from the discharge source, up to, but not exceeding the property boundary and are determined on a site specific basis. An "early warning value" must be used when an alternate point is established. They can only be established by one of four ways as explained in WAC 173-200-060(2).

Ambient Water Quality--The existing environmental condition of the water in a receiving water body.

Background Ground Water Quality – Is statistically defined as the 95 percent upper tolerance interval with a 95% confidence.

Best Management Practices (BMPs)--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5--Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Composite Sample--A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite"(collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots.

Continuous Monitoring –Uninterrupted, unless otherwise noted in the permit.

Distribution Uniformity--The uniformity of infiltration (or application in the case of sprinkle or trickle irrigation) throughout the field expressed as a percent relating to the average depth infiltrated in the lowest one-quarter of the area to the average depth of water infiltrated.

Early Warning Value – Is a concentration set in accordance with WAC 173-200-070 that is a percentage of an enforcement limit. They can be established in the effluent, ground water, surface water, the vadose zone or within the treatment process.

Enforcement Limit – Is the concentration for an individual contaminant that represents the maximum allowable concentration which can be detected at a specific point of compliance in the ground water

Engineering Report--A document, signed by a professional licensed engineer, which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Grab Sample--A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Industrial Wastewater--Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

pH--The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Point of Compliance – Is the location where the facility must be in compliance with the Ground Water Quality Standards. It is determined on a site specific basis and approved or designated by Ecology. It should be located in the ground water as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible.

Quantitation Level (QL)-- A calculated value five times the MDL (method detection level).

Soil Scientist--An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting Scientists or who has the credentials for membership. Minimum requirements for eligibility are: possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5,3,or 1 years, respectively, of professional experience working in the area of agronomy, crops, or soils.

State Waters--Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Dissolved Solids--That portion of total solids in water or wastewater that passes through a specific filter.

Water Quality-based Effluent Limit--A limit on the concentration of an effluent parameter that is intended to prevent pollution of the receiving water.

APPENDIX C--TECHNICAL CALCULATIONS

ADDENDUM 1:

The upper tolerance limit values (background) for nitrate and TDS in the ground water at the upgradient wells were determined using the Sanitas for Ground Water and Environmental Media v. 8 6 statistical package. The basic steps that were used included:

1. Checked for outliers: all outliers were removed from the data set before any calculations were done.
2. Checked for seasonality: whenever seasonality was found, the data was "de-seasonalized" and the alternate values were then used.
3. Checked for any trend: whenever a trend was detected, the earliest data values were progressively eliminated until there was no significant trend; the remaining database was used for determining the upper tolerance limit.

A graphical presentation of this process and the results for each upgradient well is presented in ADDENDUM 2.

ADDENDUM 3:

1. Linear regression lines for the downgradient wells were determined using EXCEL, and not forcing the line through zero
2. The Sen's slope estimator values were determined using the Sanitas for Ground Water and Environmental Media v. 8.6 statistical package. All values reported in the DMRs were used.

APPENDIX D--RESPONSE TO COMMENTS

Comments on the draft permit were received after the public comment period from the Permittee and the Bureau of Reclamation The comments in their entirety are attached to the Fact Sheet in Appendix D Each comment was paraphrased and a response is given

COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES

BASIC AMERICAN FOODS

538 Potato Frontage Road
Moses Lake, WA 98837

(509) 765-8601

May 2, 2006

MAY - 3 2006

Mr Don Nichols, Permit Manager
Department of Ecology
4601 N Monroe Street
Spokane, WA 99205-1295

Re: Comments on the Draft Fact Sheet and Draft State Waste Discharge Permit ST-5213

Dear Don,

We have reviewed the Basic American Foods (BAF) draft permit and fact sheet for State Waste Discharge Permit No. ST 5213. Following are our comments

1 • In the first paragraph of the Fact Sheet summary Basic American Foods would like for you to acknowledge that BAF has had a process water discharge reduction plan in place and has reduced the amount of process water applied daily to the land treatment site by 35% over the last permit cycle. In addition, it should be noted in the first paragraph that during the last permit cycle, the site operated at less than 50% of the nitrogen loading limit of 450,000 lb N/year as proposed in the BAF Engineering Report. This rate of loading is anticipated to continue during the next permit cycle.

2 • In the second paragraph of the Fact Sheet Summary, BAF would like for you to acknowledge that the plume of impacted water moving under the site originated with the leveling and disruption of the soils of BAF Fields 1 and 2. Please insert into the first sentence as follows:

> Past wastewater application and farm practices at the sprayfield site ***were improved in the 1990s to remove nutrients through crop utilization. This necessitated the leveling of the dunes for planting. The leveling of Fields 1 and 2, which had previously been used as a high rate filter/treatment system, initiated the release of nutrients from the soils that*** have adversely impacted the ground water beneath the site.

3 • In the last sentence of Bullet 4 on page 5, please insert "or equal to" so the sentence reads:

> Irrigation will be managed so that the amount of water leached below the root zone (Leaching Fraction, LF) is less than *or equal to* the leaching requirement; LF ≤ LR

This insertion is consistent with the language used in the last sentence of section, Sprayfield Total Dissolved Salt Loading (middle of page 6)

4 • In the first paragraph on page 6, the fact sheet indicates that nitrogen uptake and balance

Comment #1: Request to add language to the Fact Sheet that acknowledges BAF's water reduction plan and that N loading has been approximately 50% of the design N load.

Response: Ecology agrees to add the language. The water reduction information will be put in the "Sprayfield Hydrualic Loading" section (pg. 5), and the reduced N loading narrative will be placed in the "Sprayfield Nitrogen Loading" section (pg .6).

Comment #2: Request that language be added to the Fact Sheet summary that acknowledges the release of nitrogen from soils that were disturbed during the leveling of fields 1 and 2.

Response: The release of nitrates to the ground water from the disruption of the soils associated with the leveling of fields 1 and 2 has been noted in the discussions under the "GROUND WATER" section of the Fact Sheet. Ecology believes that this is sufficient.

Commen #3: Please add the phrase "or equal to" to the last sentence in fourth bullet on page 5.

Response: Acknowledged, and the wording will be added.

Comment #4: Recognize that BAF started to comply with the nitrogen loading requirements with the 2004 annual report.

Response: The nitrogen load summary table on page 5 of the Fact Sheet will be edited to show a new column that shows the average N uptake for the I/C fields in 2004.

A statement will be added to the "Summary of Compliance With the Previous Permit" section that shows the single year (2004) of reporting the I/C field balance values.

COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES
Don Nichols Page 2 beginning with the 2004 Annual Report Recognition of BAF efforts to comply starting with the 2004 Annual Report should also be noted on page 13 under *SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT.* 5 • The last line in the section, Moses Lake POTW, on page 7 contains a typo, "$CBOD_5$." The C should be removed or the term should be defined 6 • In the final paragraph of the Water Balance Model Risk Assessment narrative at the top of page 7, the final sentence of the paragraph should read, "The risk to ground water from nitrate leached during year around application is the same as that for irrigating only during the ***growing*** season and winter storage." 7 • In #2 on page 8 of the Fact Sheet please insert the word *impacted* in the statement so the sentence reads "The 17 irrigation wells at the site capture 99.9% of the ***impacted*** ground water traveling beneath the site in the summer." 8 • In your narrative on Downgradient Ground Water Quality on page 10 of the Fact Sheet, Basic American Foods would like to point out that linear trend analysis may not be the best means by which to evaluate the change over time of nitrate and TDS. The construction of I/C 18 & 19 (former BAF 1 and BAF 2) fields in 1994 on the site of the previous 206 acre sprayfield released nutrients into ground water This "plume" of nutrients is moving across the current treatment site, creating a rising trend as it approaches a monitor well and a declining trend as the plume moves beyond the well Therefore, a polynomial trend is a better fit for the predicted behavior. BAF has attached polynomial trend analysis of nitrate in the downgradient wells to this comment letter Most notable, MW-6 demonstrates a nitrate peak in 2003 and a decline trend since that year. This behavior fits the HG model prediction of plume movement. In addition, MW-13 is just beginning to show an upward trend in nitrate, perhaps also indicative of the movement of the nutrient plume 9 • The Technical Review conducted by WSU at the request of Ecology is discussed on pages 11 – 13 of the Fact Sheet. As noted on page 13, BAF is preparing a rebuttal to the allegations of this independent review. To meet the timeline for comments on the Fact Sheet, BAF has informed Ecology that this rebuttal will come under separate cover from this letter. As a summary statement for this letter, BAF does not agree with the conclusion that *current practice* of process water application on the land treatment site is continuing to impact ground water quality We stand by the conclusions of our Engineering and Hydrogeological Reports that the current practice of year round application of process water on more than 2,300 acres does meet the definition of AKART. As demonstrated in the 2003 Addendum to the Engineering Report, implementation of a winter storage pond and application of process water during the growing season only will not be more protective of ground water quality 10 • In the second paragraph of the section, Engineering Report, on page 12 please change the word "would" to "could." 11 • At the conclusion of the section, Engineering Report, on page 12, please include the statement:	Comment #5: Correct the typo in the Fact Sheet section, "Moses Lake POTW"; $CBOD_5$ should be BOD_5. Response: $CBOD_5$ is "carbonaceous biochemical oxygen demand" and is the design parameter used for the Moses Lake POTW. A definition will be added to the narrative. Comment #6: Edit the "Water Balance Model Risk Assessment" section in the Fact Sheet to show "growing season" instead of "non-growing season. Response: Acknowledged; the change will be made. Comment #7: The sentence in #2 of the "MODFLOW modeling" section should read, "...99.9% of the impacted ground water..." Response: Acknowledged; the word will be added. Comment #8: BAF has attached polynomial trend analysis graphs for the down gradient wells, and is a better predictor of the behavior of the ground water. Response: It is Ecology's understanding that polynomial trend lines only explain the data set for which it is based. It can not be used with any confidence as a "predictor" of values outside of the data set. The best estimator of values outside of the data set is a linear regression. It is unknown what order of polynomial was used for the graphs attached by BAF. It is observed that the attached trend lines begin in Dec 2001 instead of the November 1997 when the data set begins and as used in the Fact Sheet graphs. Comment #9: BAF does not agree with the WSU review conclusion that current practices at the land treatment site is continuing to impact ground water quality. BAF stands by its analysis that current land application practices is AKART. Response: Ecology acknowledges BAF's position on its disagreement with the WSU conclusions and its belief that they are providing AKART. Ecology will be submitting comments on BAF's modeling report that supports its AKART position. The Fact Sheet will be edited to direct the reader to BAF's comment.

COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES
Don Nichols Page 3 BAF recognizes that as the soils warm and nitrifying bacteria become active, there is an increased potential to leach nitrates into the ground water. BAF believes this does not mean that waste water should not be applied; only that water in total should not be applied in excess of crop need. 12 • At the conclusion of Bullet A on page 12, please insert the following: BAF has clarified that the 99.9% capture figure contained in its HG report refers only to the plume of *nitrate impacted* ground water moving beneath the site, not to the total of ground water moving beneath the site. 13 • The last sentence of Bullet B on page 12 should read: The ground water database does not allow the determination *if* the impacts are from summer or winter applications, or if the source of nitrogen is from the wastewater or commercial fertilizer 14 • In the first paragraph of page 14, the lower organic strength of the BAF wastewater is attributed to less intensive peeling and not using fry oil. In addition, it should be noted that a dehydration plant has much less intensive *slicing and cutting* of the potato tubers than a fry plant. 15 • In the Irrigation and Crop Management Plan discussion on pages 21 – 22, DOE notes, "The annual scheduled use for most of the I/C fields to receive wastewater during winter months would not appear to meet the requirements for de minimis application." BAF does not agree with this conclusion nor has Ecology stated a rationale for it. In the DOE Permit Writers Manual, under the section De Minimis Application of Food Process Wastewater, p. VIII-9, it states, "De minimis application of food process wastewater to land via irrigation for the purpose of treatment is an application that occurs infrequently (e.g. once per year), on a limited area (e.g. one-time applications to a specific field), and/or at a nutrient loading rate that is well below the crop requirement." Each year, there are I/C fields that receive limited process water. The nutrient loading rate *from the process water* is well below the crop requirement; i.e. a de minimis application. BAF proposed two inches or less in the 2003 Addendum to the 2001 Engineering Report because this hydraulic and nutrient load would represent no more than six days per year of application; i.e. an infrequent or de minimis application. Appendix A to this letter is a set of graphs that show the nitrogen loading to each field over the last permit time period. In all cases, nitrogen loading from process water is below the agronomic limit. In addition, since 2003, 50% or more of the I/C fields receive zero to 10% of the agronomic limit annually (Chart 1 of Appendix A). Zero to 10% equates to less than six inches of hydraulic load or less than 32 lb nitrogen per acre; i.e. an infrequent or de minimis application. 16 BAF objects strongly to the position taken by Ecology on p. 21 that "if any wastewater is applied to a field, then a nutrient and water balance must be determined and presented in the ICM plan." BAF objects for the following reasons: 1. The Permit Writers Manual states, "To qualify as a de minimis discharge, the permittee must clearly demonstrate in an Engineering Report that the discharge will have minimal potential to impact ground water." The 2001 BAF Engineering Report	Comment #10: Please change the second paragraph of the "Engineering Report" section in the Fact Sheet from "would" to "could" Response: Acknowledged and agree. Comment #11: BAF requests that a statement be added to the end of the "Engineering Report" section in the Fact Sheet. Response: This section of the Fact Sheet will be edited to direct the reader to BAF's comment and their statement. Comment #12: BAF requests that bullet A in the "Hydrogeologic Report" section of the Fact Sheet show that the 99.9% capture refers to the "nitrate impacted" ground water. Response: This section of the Fact Sheet will be edited to direct the reader to BAF's comment and their statement. Comment #13: Bullet B in the "Hydrolgeologic Report" section of the Fact Sheet should read, "..the determination if the impacts are..." Response: Acknowledged and corrected. Comment #14: The second paragraph in the "Wastewater Characterization" section of the Fact Sheet should show that BAF's dehydration process uses less slicing and cutting than a conventional fry plant. Response: Acknowledged; wording will be added to show this. Comment #15: BAF believes that the application of wastewater to the I/C fields meets Ecology's definition of a *de minimis* application of food process wastewater.

seasons management of plant available nitrogen,in combination with the ability to recover losses from groundwater has a definite minimal impact to groundwater. As noted on page 14 of the 2003 addendum to the Engineering Report, it is in our plan that some fields receive small amounts of process water each year and therefore have minimal potential to impact ground water; i.e a de minimis discharge.

2. The I/C fields operate as a commercial farm. The agreement between BAF, Isaak and Cox does not include provisions for BAF to dictate the quantity and timing of commercial fertilizer application. The farmer does regular petiole sampling to determine crop needs for supplemental fertilizer. Nutrient and water balance on I/C fields that receive a de minimis annual application of process water (i e. two inches or less) is essentially a scorecard on commercial agriculture, not industrial process water treatment.
3. The position does not recognize the repeated requests by BAF to consider and implement a plan that recognizes de minimis application. The lack of recognition of de minimis application concerns BAF deeply that Ecology may one day regulate the amount of commercial fertilizer that can be applied to the commercial crops on the I/C fields. Commercial agriculture is a very integral piece to the success of the BAF land treatment site. If supplemental fertilizer quantity and timing of application were ever to be regulated by Ecology, the site would be in danger of failure and BAF operating costs in the State of Washington at risk for rising to less competitive levels.
4. The practice of commercial farming on the I/C fields, including the application of commercial fertilizers, will continue with or without the application of BAF's process water. Thus, any risk of possible over-application of commercial fertilizers will continue irrespective of BAF's participation.

17 • In response to the two points at the bottom of page 22 of the fact sheet, BAF notes:

1. All of the fields make up the wastewater treatment system for the BAF facility but not all of the fields receive process water every season. The I/C fields that receive no or a de minimis application (two inches or less per year) of process water in a given year are not active treatment fields. Reasoning for recognition of de minimis application is given above.
2. It is not clear how Ecology proposes to identify BAF-sourced nitrate in the groundwater as the result of current practices. The nitrogen isotope analysis suggested on page 25 of the fact sheet is a research project beyond the scope of the operating waste discharge permit and the resources of BAF. Nutrient and water load information from I/C fields that receive no more than a de minimis annual application does not "insure that BAF is not causing an impact the ground water beneath the site." Rather, it measures commercial agriculture nutrient and water loading. Our concerns with this are noted above.

18 • Regarding the section, Petiole Testing, at the top of page 24 of the Fact Sheet, BAF proposed the use of petiole testing vs. fertilizer applications on the I/C fields as an alternative to the intensive crop, nutrient, and hydraulic monitoring Ecology had proposed in the previous draft permit. BAF made this proposal in support of its plan to *estimate* the flows to the I/C fields. Rather than requiring ongoing petiole comparison as noted in the annual reporting requirements in the draft permit, BAF proposes to do a one-year comparison for the 2006 report. Ecology and BAF could then discuss the value of comparison and determine a go-forward strategy.

Response: The guidance for *de minimis* discharges was written in response to a request from a vegetable processor brought to Ecology through the PNW Food Processors Association. The purpose of the request was to eliminate the requirement for ground water monitoring by being able to demonstrate that a *de minimis* discharge would, in part, have the lowest potential to impact ground water; nothing more. Approval of a site as a *de minimis* application was to be via information in the engineering report that the application of wastewater would be protective of the existing and future beneficial uses of the ground water. Ecology is not yet convinced that the application of wastewater onto the I/C field's sandy soils during the winter season with relatively shallow ground water is protective of the ground water. In addition, the application of process wastewater to many of the I/C fields occur more often than once per year; a requirement of a *de minimis* discharge. The 2004 I/C plan shows 10 of the I/C fields received wastewater more than once during the year. For these reasons, the application of process wastewater onto the I/C fields do not meet the definition of a *de minimis* application, nor in Ecology's opinion does it meet the intent for which the guidance was written.

Comment #16: BAF strongly objects to Ecology' position that if any wastewater is applied to the fields, that a nutrient and water balance be determined and presented in the annual report. BAF objects based on four reasons as stated.

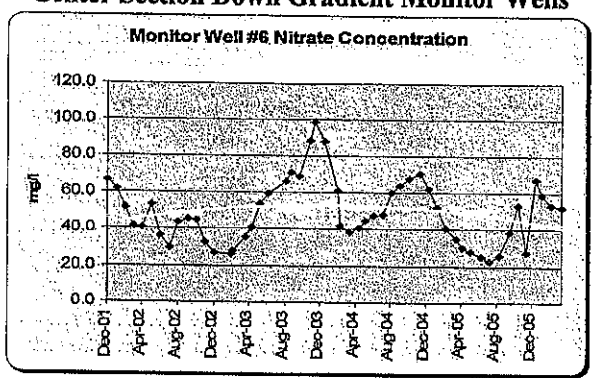
Response: As stated previously, Ecology does not consider the application of wastewater onto the I/C fields to meet the definition or intent of *de minimis* application. Even if it did, it would not have any impact on the need to account for the water, nutrient, and salt loading to the fields, or the need to continue ground water monitoring. As explained in the seventh paragraph of the "Irrigation and Crop Plan" section of the Fact Sheet, RCW 90.48.080 states it is unlawful for any person "..to cause..." pollution of waters of the state. It is uncertain how BAF could demonstrate it is not causing impact to the ground water if a full accounting of what is being applied to all fields is not reported.

Comment #17: BAF responds to Ecology's two items in the "Irrigation and Crop Management Plan" section that supports flow measurements to each field.

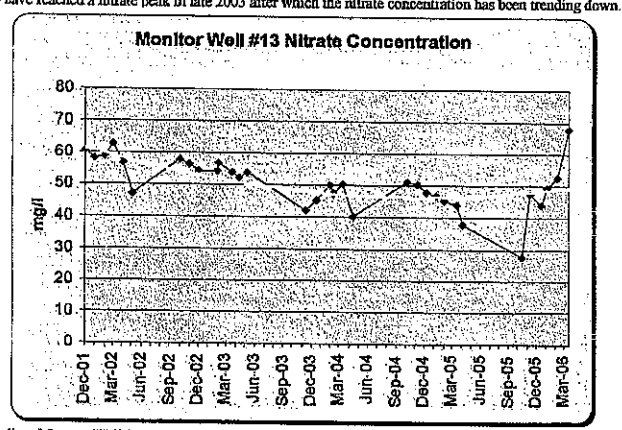
COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES
Don Nichols Page 5 19 • In your discussion on supplement monitoring on page 25 of the Fact Sheet, BAF feels that the City of Moses Lake's waste treatment plant (POTW) should also be mentioned as a potential source for nitrates that are possibly being leached to the ground water 20 • BAF proposes the first sentence of S2.D.1. in the draft permit to read, "The Permittee shall perform soil monitoring on each ***alfalfa field*** and fields IC7, 10, and 14 twice per year." Also reference CES comments in Appendix B for further discussion on soil monitoring parameters 21 • S2.E of the draft permit requires crop monitoring of the grain/grass type crops (alfalfa; wheat; mint, etc.) in each field once per harvest. The soil type, growing conditions, and crop yields across the site are very homogeneous and BAF proposes to sample all fields as a composite relative to crop type once per harvest with exception to the alfalfa fields which each field will be sampled once per harvest. 22 • Please reword S2.F of the draft permit to require that BAF conduct "*representative sampling of any unusual discharge or discharge condition, including bypasses, upsets and maintenance-related conditions* ***that can reasonably be expected to significantly, adversely affecting*** *effluent quality.*" Explanation: It is common (not unusual) for a mechanical failure to cause a piece of equipment or a line to be temporarily shut down while maintenance is performed Bypassing the piece of equipment or shutting down the line can, in turn, cause conditions *beneficially "affecting effluent quality"* (e.g., reducing the strength of the waste). BAF would not consider that it must conduct additional sampling every time such an event occurs 23 • In S3.G of the draft permit mentions the reporting the results of a soluble BOD report We know of no certified method to measure soluble BOD and feel that this report is again purely research and is outside the scope of the operating waste discharge permit 24 • In S4.B of the draft permit BAF proposes the following language for the opening paragraph: "The Permittee shall notify the Department in the monthly discharge monitoring report of any spill, overflow, or bypass of a duration less than 24 hours from any portion of the treatment system If the duration is greater than 24 hours, immediate notification is required." Over the last permit cycle, these occurrences have been minor in nature. BAF would like to incorporate into monthly reports rather than having to create a separate correspondence for administration efficiency. 25 • In S4.C.3 , please insert the word "annual" so as to read, "Gross *annual* nitrogen loading shall be limited to:" 26 • In S4 C.4 , BAF objects to the phrase, "*or under the control of ..*" and suggests instead "*permitted for process water application by the Permittee.*" As BAF has stated previously, we do not intend to control the operation of the I/C fields other than to control the timing of application of BAF's process water on the I/C fields 27 • S4.D1 reads "A healthy viable cover crop shall be maintained on all fields that receive	Response: As stated previously, it is Ecology's opinion that the amount of water and nutrients added to all fields be reported to demonstrate the protection of the ground water. In support of the Water Pollution Control Law referenced in the Fact Sheet, the state waste discharge permit regulation gives Ecology the authority to condition permits with, "Any appropriate monitoring, reporting and record keeping requirements.." when applicable; WAC 173-216-110(1)(g). The referenced use of nitrogen isotope analysis in the Fact Sheet was meant as a suggested tool to be used by BAF to better demonstrate whether the year around applications are impacting the ground water. Comment #18: BAF's proposal for petiole testing was made to replace extensive crop, nutrient, and hydraulic loading to the I/C fields. BAF proposes to do a one year petiole testing and latter discuss with Ecology it usefulness. Response: Ecology removed extensive soil and crop monitoring for each I/C field in the first permit draft with the understanding that petiole testing would be done to better manage fertilizer applications that would lessen the buildup of nutrients in the soil and maximize crop growth and nutrient uptake. The measurement of flows to each field would not be sacrificed. The draft permit will not be changed with regard to flow measurement or petiole testing to better help manage water and fertilizer applications. Comment #19: BAF feels that the city's POTW has also contributed to nitrates in the ground water, and this should be stated in the "Supplemental Monitoring" section of the Fact Sheet. Response: The nitrogen in the facultative POTW lagoons is mostly in form of organic and ammonia nitrogen, not nitrate. A review of POTW data (Jan 92-April 97) shows nitrate levels are low with the highest being 11.9 mg/L. Facultative municipal wastewater lagoons contribute little nitrate to the ground water. Comment #20: Section S2.D.1 of the permit should read, "..on each alfalfa field.."

COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES
Don Nichols Page 6 viable cover crop during the winter non-growing season However, it is understood that during periods of adverse weather or other system upsets, wastewater may be applied to fields without a healthy or viable cover crop " It is understood that during the winter the microbial activity required to convert the insoluble organic nitrogen from the wastewater into soluble nitrates virtually stops due to low soil temperatures (CES Engineering Report 2001). Therefore the practice of applying wastewater, for short periods of time during the winter, to land without a cover crop is not harmful to groundwater 28 • BAF has attached as Appendix B comments from Cascade Earth Sciences to the draft permit and fact sheet. These comments were made at the request of BAF and have our support. This concludes the comments that Basic American Foods has on the draft Fact Sheet and Waste Discharge Permit ST-5213 exclusive of comments on the WSU technical report. Comments on the WSU technical report will be submitted under separate cover If you have any questions or would like to discuss any of the comments further please contact me Sincerely, Brian Meiners, Plant Manager Basic American Foods	Response: The draft permit requires soil testing, in part, on each BAF field. Changing the language to each "alfalfa field" would mean that any BAF field that is rotated out of alfalfa would not be tested. Therefore, to insure that the BAF fields are soil tested regardless of the crop; the permit language will be changed to require monitoring "..on each BAF treatment and alfalfa sprayfield, and fields IC7, 10, and 14 twice per year." Comment #21: In Section S2.E of the draft permit BAF proposes to sample all fields as a composite relative to crop type once per harvest, with the exception of alfalfa. Response: Ecology is uncertain about BAF's comment on the requirement to sample crops "in each field once per harvest." The draft permit requires crop monitoring "..for each crop grown, at least once per harvest." To clarify the sampling requirement, the second sentence in Section S2.E will be changed to: "Composite samples will be **comprised of samples collected from all fields relative to crop type once per harvest with the exception of the alfalfa fields which will be sampled once per harvest. Composite samples will be** comprised of at least ten (10) random samples collected from each field." Comment #22: BAF requests that wording in Section S2.F of the permit be changed. Response: The wording in Section S2.F is standard permit language. The suggested wording changes of "reasonably" and "significantly" are open for interpretation of their meaning. It is understood that O&M activities can change the characteristics of the wastewater, but it is believed that as long as samples are collected in a manner this is representative of the wastewater that Section S2.F will be complied with. Comment #23: There is no certified method to measure soluble BOD and believe that it's testing requirement is research. Response: As explained in the "Monitoring Requirements" section of the Fact Sheet, and under the authority of WAC 173-216-110(1)(g), some limited soluble BOD testing will be required for the irrigated wastewater. Ecology acknowledges there is no description of soluble BOD testing in Standard Methods. The only difference in the soluble vs. total BOD test is that the sample is filtered (soluble) before the test is run. Ecology's lab certification office has been consulted and has agreed that as long as the

Polynomial
Center Section Down Gradient Monitor Wells



Downgradient Monitor Well #6: Trend: Down. Using the polynomial trend function in EXCEL, this well appears to have reached a nitrate peak in late 2003 after which the nitrate concentration has been trending down.



Downgradient Monitor Well #13: Trend: Down. The polynomial trend function of EXCEL demonstrates a general downward trend until 2005. The upward spike at the end of the chart could be indicative of the passage of the nitrate slug released when the former BAF 150-acre sprayfield was converted to circle-irrigated farm ground in 1994.

permit manager agrees to the procedure, that the lab will acknowledge the test as long as the methodology is clearly described in the testing lab's SOP manual. The use of a glass fiber filter or filter with a 1.2 um pore opening is acceptable for filtering. A footnote in Section S2.A of the permit will be added for soluble BOD; "Filter sample through at least a 1.2 um filter prior to conducting the test."

Comment #24: BAF recommends language changes in Section S4.B of the draft permit.

Response: The wording in Section S4.B is standard permit language, and is based on NPDES reporting requirements; 40 CFR, Part 122.41(m). The reporting requirement for a bypass is within 24hrs of the event; there is no other qualifier for reporting. BAF's recommendation is based on the duration of a bypass (24hrs). Unfortunately, this does not agree with NPDES requirements, and with pump capacities as high as 0.85 mgd (590 gal/min), a bypass/spill of <24hrs could result in a large amount of water being discharged. Notification of spills, overflows, or bypasses can be oral or by email, both relatively easy to do. The permit language in Section S4.B will not be changed.

Comment #25: BAF requests that Section S4.C.3 of the draft permit read, "Gross **annual** nitrogen loading"

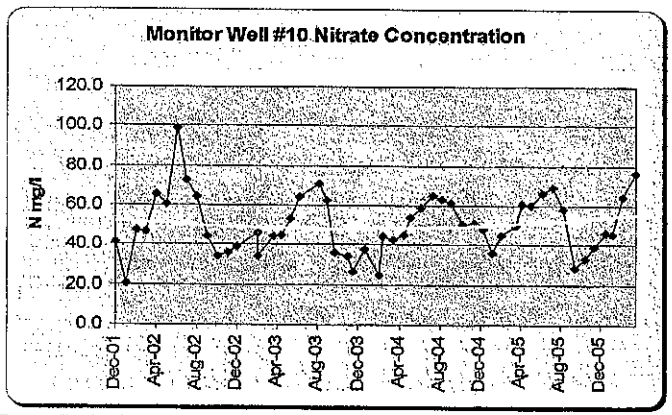
Response: Agreed.

Comment #26: BAF requests that Section S4.C.4 of the draft permit be changed with suggested new language.

Response: Ecology recognizes that BAF does not own or control most of the treatment sprayfields; I/C fields. The language in this section will be changed to reflect this: "...to any surface waters of the state or to any land not ~~owned by or under the control of the Permittee~~ **permitted for process wastewater application by the Permittee.**

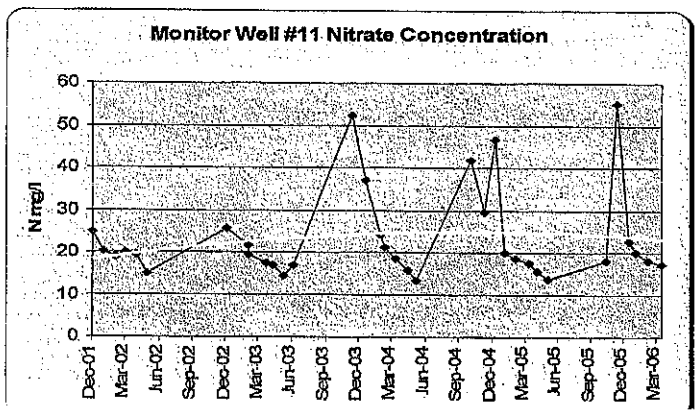
Comment #27: Section S4.D.1 should be changed to allow for the application of wastewater for short periods of time onto lands without a cover crop. Low soil

Polynomial
Center Section Down Gradient Monitor Wells
Continued



Downgradient Monitor Well #10: Trend: Flat Stable nitrate concentration with a predictable pattern of peak nitrate concentration in the summer.

Polynomial
NW Section Down Gradient Monitor Wells



temperatures virtually stops any conversion of organic nitrogen to soluble nitrates.

Response: The quoted phrase in BAF's comment does not match the statement in section S4.D.1, especially the sentence "However, it is understood that during periods of adverse weather or other system upsets, wastewater may be applied to fields without a healthy or viable cover crop." Ecology did not make this statement.

Ecology recognizes that the conversion of organic and ammonia nitrogen to soluble nitrates is low during the winter months. However, there are short periods of time during the winter in the basin when conversion can occur. The most critical time is in the Spring when temperatures soil temperatures increase and plant uptake lags behind the availability of soluble nitrates.

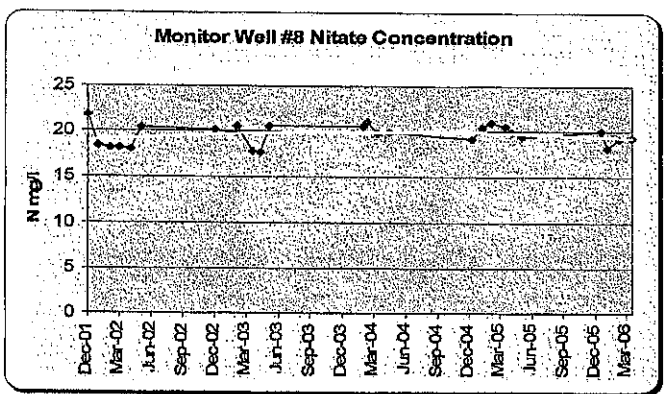
Ecology's guidance on land treatment systems is clear about maintaining a viable crop to achieve a level of treatment that reduces the potential for nitrates to leach to the ground water. This is supported by most literature on land treatment systems that have concluded that the risk to ground water is high when wastewater is applied to fallow fields.

The wording in Section S4.D.1 reflects Ecology guidance and will be unchanged.

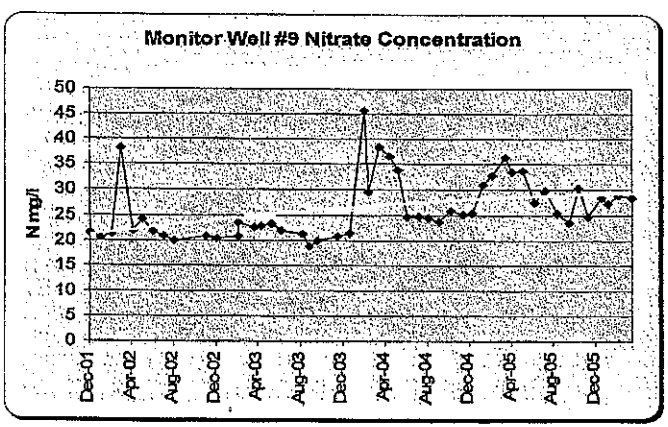
Comment #28: Appendix B contains additional comments that BAF supports.

Response: Acknowledged; Ecology will respond to these comments.

Polynomial
SE Section Down Gradient Monitor Wells



Downgradient Monitor Well #8: Trend: Flat. This well demonstrates the most stable concentration over the permit time period, around 20 ppm nitrate.



Downgradient Monitor Well #9: Trend: Up. Upward trend with a notable shift up at the end of 2003

COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES
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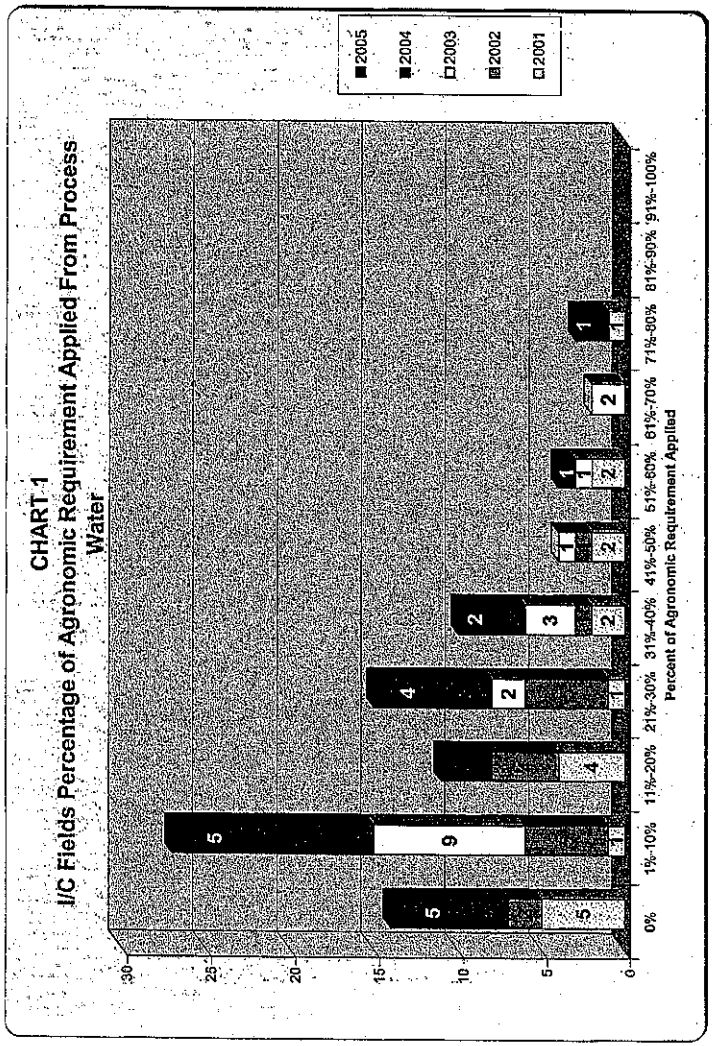
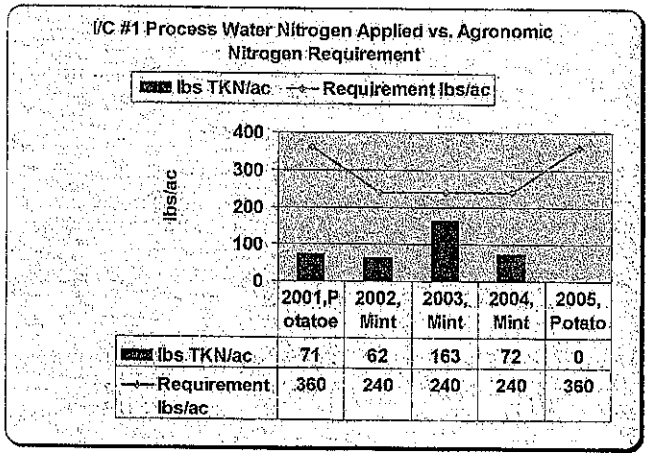
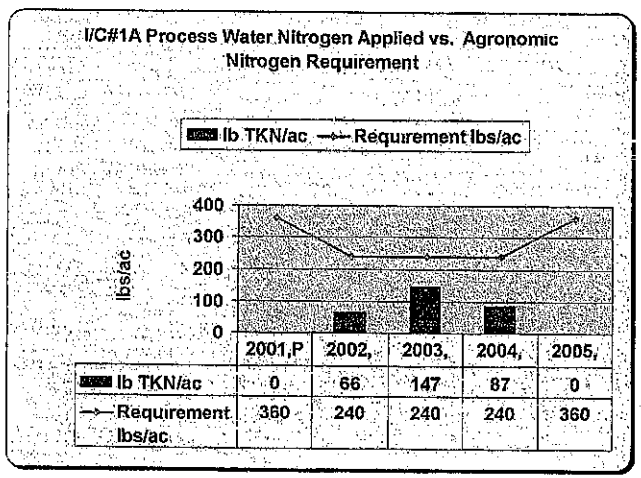
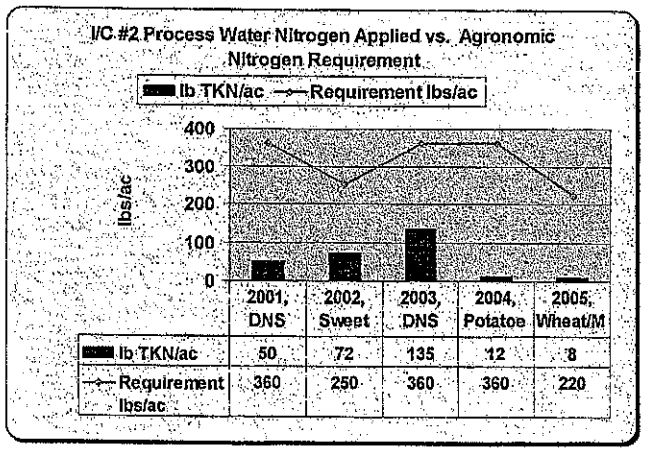
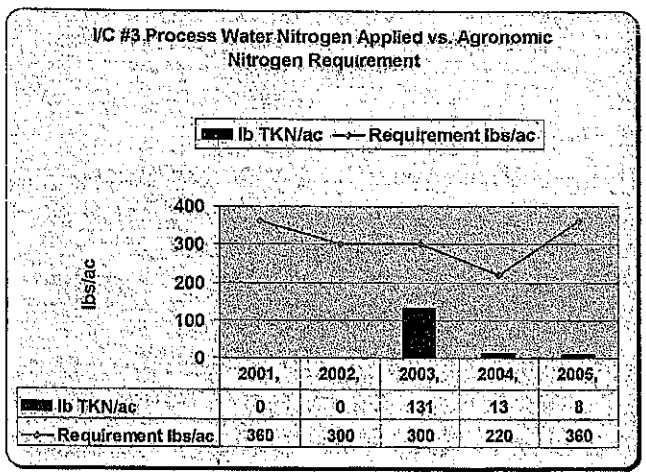
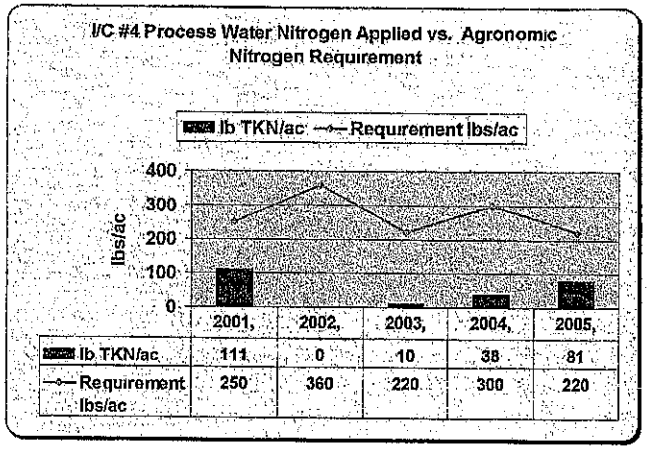
	

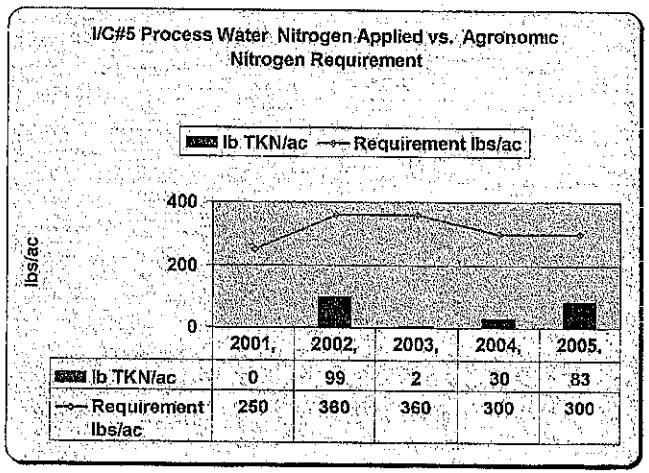

I/C #1 Process Water Nitrogen Applied vs. Agronomic Nitrogen Requirement
lbs TKN/ac
Requirement lbs/ac
lbs/ac
400
300
200
100
0
2001,Potatoe
2002, Mint
2003, Mint
2004, Mint
2005, Potato
lbs TKN/ac 71 62 163 72 0
Requirement lbs/ac 360 240 240 240 360


I/C#1A Process Water Nitrogen Applied vs. Agronomic Nitrogen Requirement
lb TKN/ac
Requirement lbs/ac
lbs/ac
400
300
200
100
0
2001,P
2002,
2003,
2004,
2005,
lb TKN/ac 0 66 147 87 0
Requirement lbs/ac 360 240 240 240 360


I/C #2 Process Water Nitrogen Applied vs. Agronomic Nitrogen Requirement
lb TKN/ac
Requirement lbs/ac
lbs/ac
400
300
200
100
0
2001, DNS
2002, Sweet
2003, DNS
2004, Potatoe
2005, Wheat/M
lb TKN/ac 50 72 135 12 8
Requirement lbs/ac 360 250 360 360 220


I/C #3 Process Water Nitrogen Applied vs. Agronomic Nitrogen Requirement
lb TKN/ac
Requirement lbs/ac
lbs/ac
400
300
200
100
0
2001,
2002,
2003,
2004,
2005,
lb TKN/ac 0 0 131 13 8
Requirement lbs/ac 360 300 300 220 360


I/C #4 Process Water Nitrogen Applied vs. Agronomic Nitrogen Requirement
lb TKN/ac
Requirement lbs/ac
lbs/ac
400
300
200
100
0
2001, 2002, 2003, 2004, 2005,
lb TKN/ac 111 0 10 38 81
Requirement lbs/ac 250 360 220 300 220


I/C#5 Process Water Nitrogen Applied vs. Agronomic Nitrogen Requirement
lb TKN/ac
Requirement lbs/ac
lbs/ac
400
200
0
2001, 2002, 2003, 2004, 2005,
lb TKN/ac 0 99 2 30 83
Requirement lbs/ac 250 360 360 300 300

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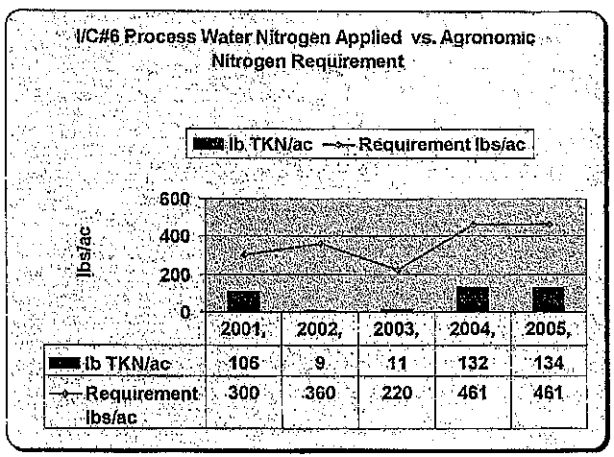
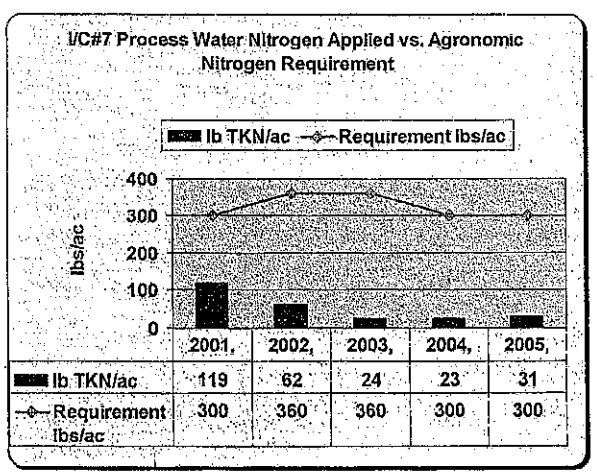
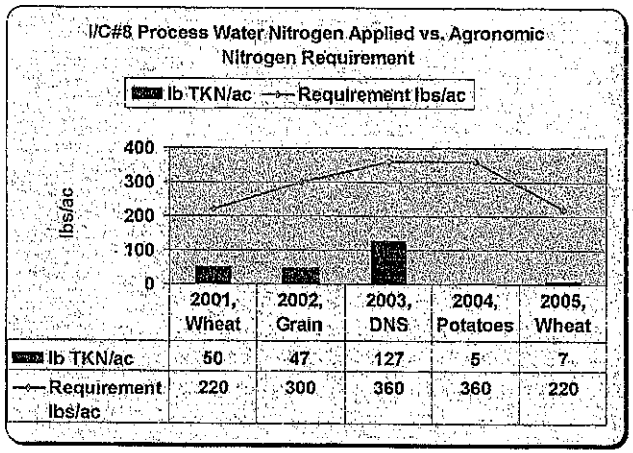
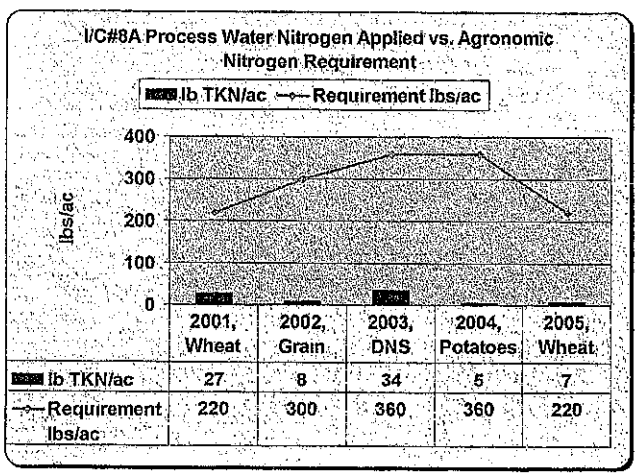


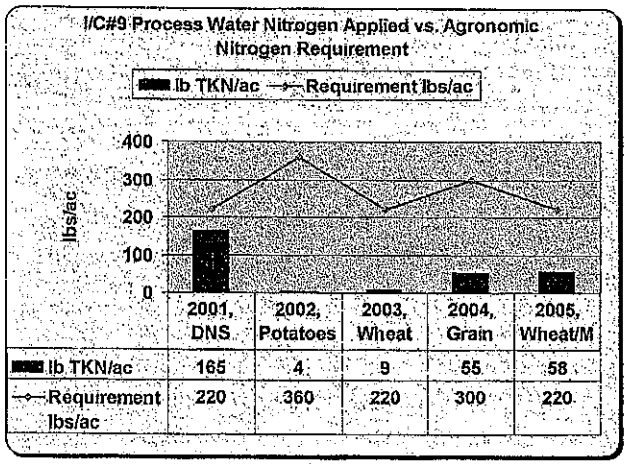


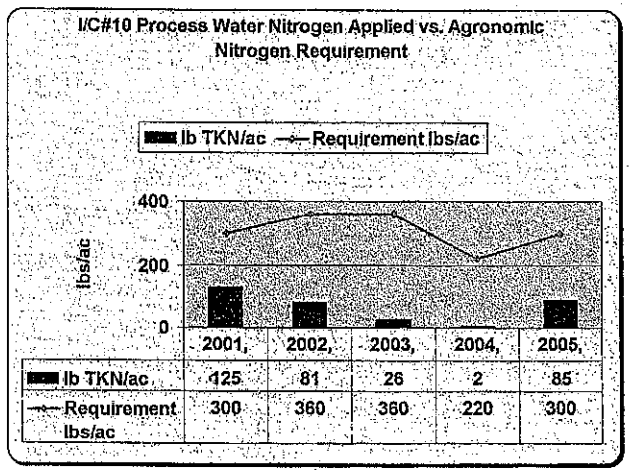


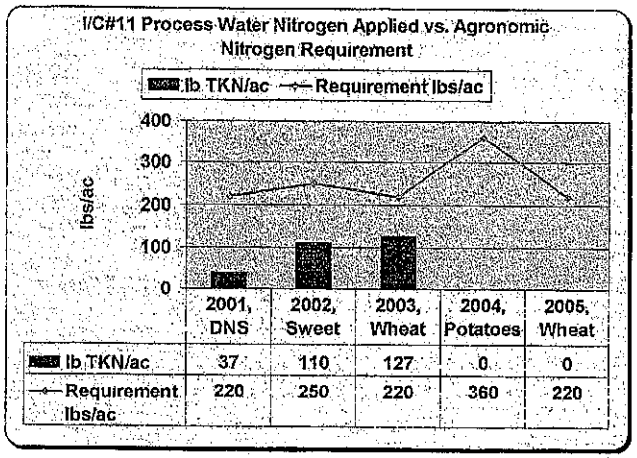
	2001, Wheat	2002, Grain	2003, DNS	2004, Potatoes	2005, Wheat
lb TKN/ac	50	47	127	5	7
Requirement lbs/ac	220	300	360	360	220

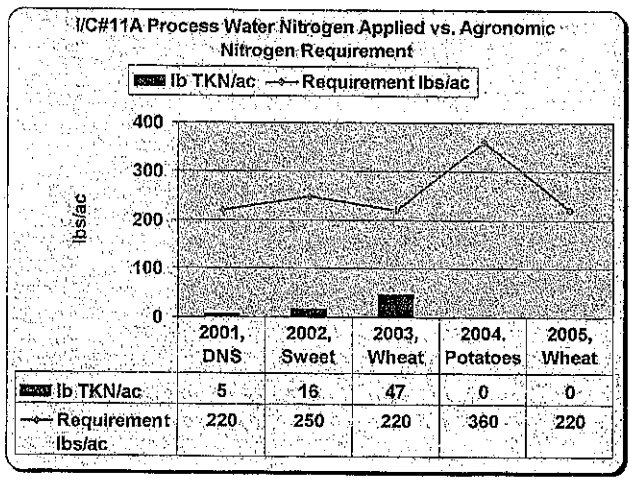


	2001, Wheat	2002, Grain	2003, DNS	2004, Potatoes	2005, Wheat
lb TKN/ac	27	8	34	5	7
Requirement lbs/ac	220	300	360	360	220


I/C#9 Process Water Nitrogen Applied vs. Agronomic Nitrogen Requirement
lb TKN/ac
Requirement lbs/ac
lbs/ac
400
300
200
100
0
2001, DNS
2002, Potatoes
2003, Wheat
2004, Grain
2005, Wheat/M
lb TKN/ac 165 4 9 55 58
Requirement lbs/ac 220 360 220 300 220


I/C#10 Process Water Nitrogen Applied vs. Agronomic Nitrogen Requirement
lb TKN/ac
Requirement lbs/ac
lbs/ac
400
200
0
2001,
2002,
2003,
2004,
2005,
lb TKN/ac 125 81 26 2 85
Requirement lbs/ac 300 360 360 220 300


I/C#11 Process Water Nitrogen Applied vs. Agronomic Nitrogen Requirement
lb TKN/ac
Requirement lbs/ac
lbs/ac
400
300
200
100
0
2001, DNS
2002, Sweet
2003, Wheat
2004, Potatoes
2005, Wheat
lb TKN/ac 37 110 127 0 0
Requirement lbs/ac 220 250 220 360 220


I/C#11A Process Water Nitrogen Applied vs. Agronomic Nitrogen Requirement
lb TKN/ac
Requirement lbs/ac
lbs/ac
400
300
200
100
0
2001, DNS
2002, Sweet
2003, Wheat
2004, Potatoes
2005, Wheat
lb TKN/ac 5 16 47 0 0
Requirement lbs/ac 220 250 220 360 220

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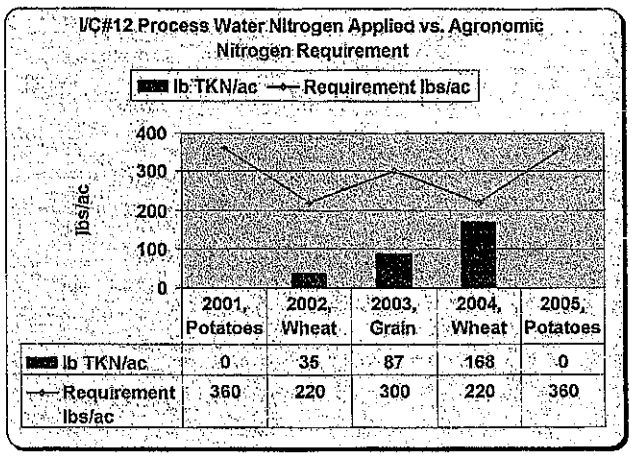
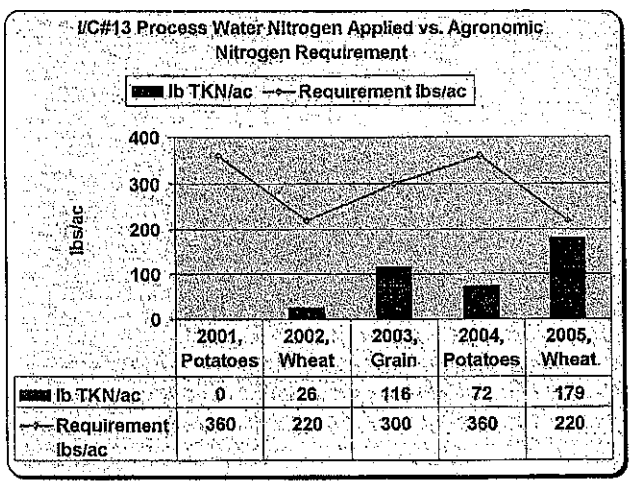
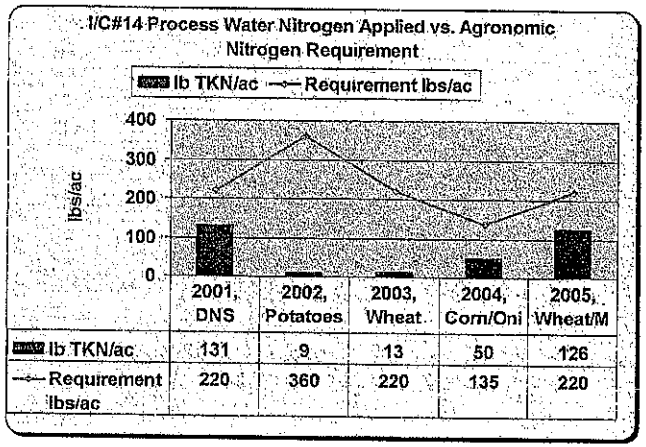
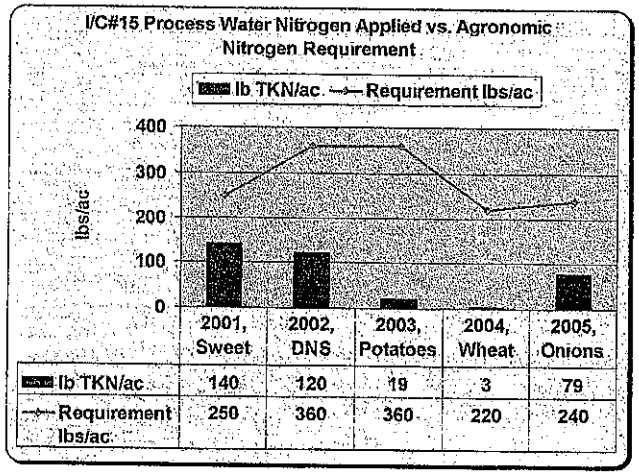





I/C#14 Process Water Nitrogen Applied vs. Agronomic Nitrogen Requirement
lb TKN/ac
Requirement lbs/ac
lbs/ac
400
300
200
100
0
2001, DNS
2002, Potatoes
2003, Wheat
2004, Corn/Oni
2005, Wheat/M
lb TKN/ac 131 9 13 50 126
Requirement lbs/ac 220 360 220 135 220


I/C#15 Process Water Nitrogen Applied vs. Agronomic Nitrogen Requirement
lb TKN/ac
Requirement lbs/ac
lbs/ac
400
300
200
100
0
2001, Sweet
2002, DNS
2003, Potatoes
2004, Wheat
2005, Onions
lb TKN/ac 140 120 19 3 79
Requirement lbs/ac 250 360 360 220 240

COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES
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COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES
CES Natural Solutions for Water — *Using natural systems to take the waste out of water* Phone: 509-921-0290 Fax: 509-921-1788 12720 E Nora, Suite A Spokane, WA 99216 MAY 1, 2006 Mike Dodds, Resource Manager Basic American Foods P.O. Box 1519 Moses Lake, WA 98837 SUBJECT: DRAFT PERMIT COMMENTS FOR BASIC AMERICAN FOODS, MOSES LAKE, WA Dear Mike: At your request, I have reviewed the Basic American Foods (BAF), Moses Lake draft of State Waste Discharge Permit No. ST 5213 with its accompanying Fact Sheet and have developed comments for your consideration. **FACT SHEET** 29 There are two typographical errors that could be corrected: - In the summary in the last paragraph, "asses" should be "assess". - On Page 1 in the table, 4th row, "spay" should be "spray" 30 **On Page 5, Item 5** The design capacity for biochemical oxygen demand (BOD) is reported as 32.7 x 10^6 pounds per day (lbs/day). It should be 32.7 x 10^6 pounds per year (lbs/yr). The design capacity repeated by Washington Department of Ecology (Ecology) was computed by Cascade Earth Sciences (CES) for the 895 acres of BAF fields where most process water is irrigated and doesn't include more than 1,400 acres of I/C fields (Table 6 in CES, 2001). 31 **Page 21.** A similar error describes the "Total annual BOD_5 load from the processing facility 32.7 x 10^6 pounds (lbs). The total annual load (design load) was correctly repeated by Ecology on Page 5 to be 4 x 10^6 lbs/yr (Table 6 in CES, 2001). **PERMIT ST 5213** 32 **Page 5 of 21, middle of page.** "Total annual BOD_5 load: 32.7 x 10^{6}" should be limited to the BAF fields (895 acres) with more loading possible on the I/C fields per the engineering report (CES, 2001). 33 **Page 7 of 21, Ground Water Monitoring table.** The "Ferrous iron" test should be removed. It is intended to detect reducing conditions in the groundwater. The presence of nitrate in the groundwater at the site indicates oxidized conditions. The well-drained soils/vadose zone and the low BOD loading to the fields 4 x 10^6 lbs/yr compared to capacity 32.7 x 10^6 lbs/yr to BAF fields, clearly indicates that the probability of creating reducing conditions in the groundwater is indistinguishable from zero. This test	Comment #29: Typographical errors on the summary page and on page 1. Response: Acknowledged, and corrected. Comment #30: On page 5 of the Fact Sheet, the BOD design load applies only to the 895 acres of BAF fields and does not include the I/C fields. Response: Acknowledged; item 5 on page 5 will be changed to read: "BOD: The design value for the ~~site~~ **BAF fields** was determined to be 32.7 x 10^6 lbs/~~day~~ **year.** The "FACILITY LOADING" section of the Fact Sheet will also be changed to show: "Total annual BOD_5 load **to BAF fields** from processing facility" Section S1 of the permit will be changed to read: Total annual (gross) nitrogen load **to all fields:** Total annual BOD_5 load **to BAF fields:** Comment #31: A similar error is given on page 21 for the BOD_5 loading. Response: This error has been corrected as previously explained. Comment #32: The total annual BOD_5 load value in Section S1 of the permit is incorrect. Response: This error has been corrected as previously explained. Comment #33: The ferrous iron testing requirement in Section S2.C of the permit should be removed. Response: With the addition of ammonium testing in the ground water and its potential use as an indicator of reducing conditions, ferrous iron testing will be removed fro the permit. It may be added back to the permit depending on the results of the soluble BOD

COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES
Don Nichols Page 22 It has no monitoring value at this site unless nitrate in groundwater suddenly drops to non-detectable levels for no explainable reason other than reducing conditions. 34 **Page 8 of 21, Soil Monitoring table.** The twice annual testing of organic matter (OM), pH, total Kjeldahl nitrogen (TKN) (as N), and cation exchange capacity (CEC) is not useful for monitoring purposes for the following reasons: - OM, TKN, and CEC change slowly and are not useful for monitoring because they are stable and will provide limited or no useful monitoring data TKN is dependent on soil OM. The CEC is dependent on soil OM and clay content. The soil OM and clay content change very slowly or not at all - The sensitivity of the test methods for these parameters to show changes, related to process water application, will be overshadowed by the changes due to cultivation/mixing of the upper 0.50 to 1.0 feet of soil and the limited precision of the soil sampling and testing methods for OM, TKN, and CEC The precision of TKN measurement in the soil is about +/- 50 milligrams per kilogram (mg/kg; ~ 50 lb N/ac in 0 25 feet of soil) which is about ½ the maximum application rate of process water TKN during the winter period (90 days, 142 MGD, 85 mg TKN/L). It is likely that little or no reliable measurement of nitrogen processes in the surface foot will be discernable from twice annual testing at 0-0.25, 0 25-0.50, and 0.50-1.0 feet. The precision of CEC testing is similar to TKN and the CEC test will only serve to measure the variability of the method for a stable parameter within the accuracy of the soil sampling and preparation procedures. Similar method precision and sampling accuracy relative to the typical semi-annual changes exist for OM testing. - Testing for pH might provide value for validating volatilization loss assumptions but similar information could be gained by testing the surface 0-0.50 feet. - CES recommends that the soil testing for OM, CEC, and TKN be limited to once per permit cycle instead of twice per year. The specified depths should be limited to whole foot depth increments or limited to whole foot depth increments once per permit cycle after testing at smaller increments one time for informational purposes Testing for nitrate (NO_3 [as nitrogen]) and conductivity is useful information twice per year Testing for the cations and anions (calcium [Ca], magnesium [Mg], sodium [Na], potassium [K], chloride [Cl], and sulfate-sulfur [SO_4-S]), Total-P (as P) and calculating exchangeable sodium percentage (ESP) twice per year has no monitoring value. The concentrations of most of them do not change rapidly or they are not useful for crop management on a frequent basis. Management decisions based on these parameters can easily be made with once per year testing. Bicarbonate has no standard test method in normal agricultural testing procedures. It can be tested in a saturation paste extract but the data have no monitoring or environmental significance outside of research because bicarbonate is a transitory species in the soil. This parameter should be removed from the testing list because it has no value for land application operations monitoring.	test results for the irrigated wastewater. Comment #34: It is recommended that the soil testing in Section S2.D of the permit be changed to once/permit cycle for OM, CEC, and TKN. Response: After giving considerable consideration to the recommended soil test changes, and that wastewater is applied year around Ecology has decided to make some changes to the proposed soil testing: 1. TKN, nitrate, conductivity, and pH testing will remain unchanged with respect to the frequency and soil depths. 2. The remaining test parameters will be sampled once/year at the end of the growing season. Ecology does not agree that soil testing on a "once per permit cycle" (5 year) frequency is adequate. 3. OM and CEC samples will be taken at the 0.5, 1, 2, and 4ft depths. 4. Bicarbonate, sodium, calcium, magnesium, and sulfate testing will be eliminated given the relatively low concentrations in the wastewater and low loading. Potassium and chloride testing will be not be changed given the relatively high concentrations in the wastewater.

COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES
Don Nichols Page 23 35 **Page 9 of 21, Crop Monitoring table, 1st paragraph.** The verbiage for determining which crops that require testing should be augmented with the verbiage from the last paragraph of Special Condition S8.A.2. to clarify that some crops do not need to be tested in lieu of literature values	Comment #35: It is requested that the narrative in Section S2.E, Crop Monitoring, of the permit be augmented with clarifying verbiage. Response: The permit language requires that samples be collected for "..the grain/grass-type of crops (alfalfa; wheat; mint, etc.)". Ecology believes that this is explanatory given the language in the Fact Sheet and in Section S8.A.2 of the permit.
36 **Page 14 of 21, Irrigation Land Application, Item 2.** The leaching fraction limit of 7.6 percent or 4.4 inches for the sprayfields on an annual basis is taken from Table 5 in the Engineering Report provided to Ecology in 2001 (CES, 2001). In the Engineering Report Addendum submitted in 2003 (CES, 2003), a more thorough analysis was prepared for modeling the long-term salts management at the site. The Engineering Report Addendum predicted a range of 8.6 to 11.8 inches of percolate loss for November leaching and 7.3 to 8.1 inches of percolate loss for late winter leaching to control soil salinity (data not included with report as submitted, attached). If the operations are to be run as modeled, at design flow and historical rainfall patterns, BAF would not be able to comply with this condition as written in the draft permit. Please revise the leaching limit to the amounts listed above per the modeling in the Engineering Report Addendum (see attached tables).	Comment #36: The leaching fraction limitation given in Section S4.C.2 of the permit (7.6% or 4.4 inches) needs to be updated to show the most recent values given in the 2003 engineering report addendum. Response: The design leaching fraction (LF) in the 2001 engineering report (7.6%) was determined using a target soil EC of 2 mmhos/cm. The 2003 modeling estimated the leaching fraction for different irrigation scenarios and used a target maximum salinity level of 3 mmhos/cm. Ecology views the LF value in the 2001 report as the design value and the 2003 LF values as output from a model that was developed as part of a risk analysis that used a different soil salinity target value. It is not known why the 2003 modeling used a different soil salinity value from that given in the 2001 engineering report. Until the 2001 report is changed, the LF value given in the permit will be unchanged.
37 **Page 14 of 21, Irrigation Land Application, Item 3.** The limits on gross nitrogen loading by crop are unnecessary. The limits do not account for the variety of crops and varying nitrogen needs at the site. The second paragraph on page 5 of 21 in Special Condition S1 states, "Permittee is authorized to apply wastewater to land via spray irrigation at agronomic rates, for nitrogen and water, and at rates for other wastewater constituents that are protective of background ground water quality." Agronomic rate will be documented annually by the nutrient balances and water balances reported for the site. The soil monitoring will document nitrogen accumulation or movement within the soil profile. Adjustments will be made to management practices to manage increases in soil nitrate. Therefore, limits on nitrogen loading are not needed to protect groundwater quality. Best management practices, agronomic crop management, and required monitoring are sufficient to allow for the needed operational flexibility without specifying hard loading limits in the permit.	Comment #37: The limits on gross nitrogen loading in Section S4.C.3 are unnecessary. Response: As explained in the Fact Sheet the nitrogen load limits are based on values determined and presented in the 2001 engineering report. They are labeled in the report as "design alfalfa-nitrogen utilization rate" and "design IC crop mix nitrogen utilization rate". Permit regulations do not allow the issuance of a permit that allows the exceedance of design criteria. Ecology understands that the agronomic rate will be determined each year based on the crop and soil nutrient levels. The language in Section S1 of the permit will be changed to read: "..to land via spray irrigation ~~at~~ **not to exceed the** agronomic rates, for nitrogen,....."
38 **Page 15 of 21, Best Management Practices, Item 2.** The requirement to follow annual crops with deep-rooted alfalfa, wheat or a perennial crop is too specific for a requirement. The requirement, as written, assumes that annual crops will leave excess residual soil nitrate. In addition, wheat is an annual crop and therefore couldn't be followed by potato or corn. It would be more appropriate to add verbiage to recommend that increases in residual soil nitrate should be managed through the use of deep-rooted alfalfa, wheat, or a perennial crop.	
39 **Page 15 of 21, Best Management Practices, Items 3 and 4.** Use of the wording, "...to minimize percolate losses" is restrictive and doesn't allow for adequate flexibility for soil salinity control. Rewording, "...to control percolate losses" is more appropriate and allows for managing the system as needed to protect both soil and groundwater quality.	
40 **Page 15 of 21, Best Management Practices, Item 6.** The intent of the best management practice to control the three-year running average soil profile nitrate concentration to stable or declining conditions, is to allow for management adjustments. The management adjustments would be cropping and irrigation plan adjustments that would be implemented to correct an increase in the three-year running average soil profile nitrate	

soil profile nitrate concentration." Soil profile nitrate will fluctuate normally under good management practices and the wording needs to recognize that the soil profile nitrate concentration is a diagnostic parameter not a permit compliance limit

41 **Page 15 of 21, Best Management Practices, Item 7.**
Item seven specifies that soil profile water must be monitored at least weekly on representative crops by neutron probe, or equivalent system It is not necessary to specify the monitoring device. The practice of soil moisture monitoring should be sufficient Additional text should be added to provide context that the intent of the monitoring it to "better manage irrigation scheduling on crops to promote good yields and minimal nitrogen leaching during the growing season"

42 **Page 16 of 21, Condition S8.A.3.**
Comparison of nitrogen loads to "...the values given in Section S4 C." should be changed The values in S4.C. are not necessary, as stated previously The nitrogen loads should be compared to the estimated values from the previous year's Irrigation and Crop Management Plan as stated in S8.A.4 and to the nitrogen balances and soil profile residual nitrogen concentrations.

43 **Page 17 of 21, Condition S8.A.5.d.**
The condition states that water balance calculations should include "water stored in the soil profile outside the normal growing season". An appropriate water balance that provides an estimate of percolate losses and salts leaching fraction needs to include water stored in the soil profile both in the growing season and outside the growing season CES recommends that the words "outside the growing season" be removed from the condition

44 **Page 17 of 21, Condition S8.A.8,a.**
The wording "...three-year running average end of crop year soil profile nitrate concentration and conductivity for each field shall be presented" should be revised to recognize that not all fields are monitored CES recommends that the wording be revised to " for each field monitored for soil profile nitrate shall be presented."

45 **Page 18 of 21, Condition S9.A.8.**
The vadose zone monitoring plan is required to include a description of measures to increase the frequency and intensity of soil testing during the springtime that better describes the nitrogen dynamics in the soils. This recommendation appears to be from the Washington State University (WSU) review of the BAF Engineering Report (Washington State University, 2005) At this time, CES and BAF disagree with the recommendation. The increased soil sampling frequency recommended in this item is more research than monitoring and is neither necessary nor relevant. The vadose zone monitoring system will be designed to monitor losses from the soil profile which is the intent of the WSU recommendation.

Comment #38: The requirement in the Best Management Practices section of the permit to follow annual crops with a deep-rooted crop is too specific for a requirement.

Response: Corn and potatoes are a part of the crop rotation at the land treatment site, and Ecology's experience with land treatment systems recognizes that these crops tend to leave a high residual soil N after harvest. A deep rooted crop should follow these crops. Ecology recognizes that this BMP somewhat restricts the crop rotation. The language in Section S4.D of the permit will be changed to: "Annual crops ~~will~~ **should** be followed with deep-rooted alfalfa,...."

In addition, the following language will be added to Section S7.B (Cropping Schedule for the Upcoming Year): "Trends in the residual soil nitrogen for each field shall be considered when the crop schedule is determined."

Comment #39: The use of the term "minimize percolate losses" in the Best Management Practices section of the permit should be changed to "control percolate losses".

Response: The term "minimize" is used in Ecology's guidance for land treatment systems with regard to leaching and impacting ground water. Use of this term in the permit is consistent with the guidance.

Comment #40: The soil profile nitrate trend in the Best Management Practices section of the permit needs to be re-worded to show that this is a diagnostic parameter, not a compliance limit.

Response: As explained in the O&M section of the Fact Sheet, this BMP was taken from what was reported by BAF in the 2003 engineering report addendum. The narrative in the engineering report (section 4.2.1) is given in a section entitled, "Compliance Recommendations", and the BMP as given as a "compliance point". The wording for item 6 in Section S4.D in the permit will remain unchanged.

Comment #41: The requirement to use the neutron probe method for monitoring soils moisture is too specific. The wording of the BMP should be changed to indicate the

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	need to practice soil moisture monitoring.

COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES
Don Nichols Page 25 Thank you for the opportunity to provide these comments and input. Please contact me at (509) 921-0290 if you have questions or comments. Sincerely, **CASCADE EARTH SCIENCES** Daniel Burgard, CPSSc Principal Soil Scientist DJB/jjr Att: Water Balance Summary for Land Application Operations - February Leaching Water Balance Summary for Land Application Operations - November Leaching c: Bruce Wright, BAF Corporate Brian Meiners, Mike Dodds, BAF Moses Lake Steve Verner, CES PN: 2621007 Doc: BAF Draft Permit Comments.doc **REFERENCES** Ecology 2006a. State Waste Discharge Permit Number ST 5213 (Draft) State of WA. Dept. of Ecology. March 16, 2006 21pp Ecology 2006b Fact Sheet for State Waste Discharge Permit ST-5213 Basic American Foods. State of WA. Dept. of Ecology. March 16, 2006. 73pp. CES. 2001. Process Water Land Application Engineering Report Basic American Foods, inc Moses Lake, WA November 2001 CES. 2003. Addendum to Process Water Land Application Engineering Report Basic American Foods, Inc Moses Lake, WA. December 2003 Washington State University. 2005. Report of Technical Review of Basic American Foods/Moses Lake, Wastewater Land Treatment System. November 2005	Response: The use of the neutron probe method for soil moisture and the frequency of measurement was from information given to Ecology by BAF in their description of how irrigation is managed at the sprayfield site. Ecology understands that the frequent measurement of soil moisture is intended to better manage irrigation to the fields. New language will be added to the Operations and Maintenance/Best Management Practices section of the Fact Sheet. The following will be added to item #7 in this section: "This information will help to better manage irrigation scheduling on crops to promote good yields and minimal nitrogen leaching during the growing season." Comment #42: The requirement in Section S8.A.3 should not require the comparison of nitrogen loads to the values given in Section S4.C as previously stated. Response: As previously stated, the gross annual nitrogen loan values given in Section S4.C are design values as designated in the 2001 engineering report. As allowed by the state waste discharge rule, the comparison of actual nitrogen loads to the design values is appropriate and will remain in the permit. Comment #43: Condition S8.A.5.d requires that "water stored in the soil profile outside of the normal growing season" should be included in the water balance calculation. An appropriate balance includes water stored both in and outside of the growing season. The wording in S8.A.5.d should be removed. Response: Agreed. Comment #44: The reporting requirement in Section S8.A.8.a implies that soil profile data be reported for each field. The wording should be changed to show the reporting for each field where nitrate is measured. Response: Agreed. Section S8.A.8.a will be changed to: "..and conductivity for each field **monitored for soil profile nitrate and conductivity** shall be presented".

Water Balance Summary for Land Application Operations - February Leaching

		Nov-Feb	Gross Irrigation[2]		Year-Round Land Application		Pond Nov 1-Feb 28	
					Est. Leaching Fraction[3]	Est. NO_3-N Leached	Est. Leaching Fraction[3]	Est. NO_3-N Leached
Year	Acres	Precip.[1]	Process	Fresh	inches	% Soil NO_3-N	inches	% Soil NO_3-N
1	2311	0.35	9.1	40.4	7.31	97.7%	6.34	93.1%
2	2311	1.78	9.1	39.4	7.75	97.9%	7.24	95.8%
3	2311	2.23	9.1	40.8	8.09	98.2%	7.49	96.2%
4	2311	2.67	9.1	42.0	8.06	92.7%	7.32	89.8%
5	2311	1.85	9.1	41.9	7.88	97.9%	7.01	93.2%
6	2311	4.44	9.1	35.7	7.70	95.7%	7.32	94.2%
7	2311	4.13	9.1	38.6	7.90	97.1%	7.45	92.2%
8	2311	5.74	9.1	36.0	7.56	87.2%	6.97	84.1%
9	2311	3.24	9.1	27.9	6.29	81.9%	6.18	82.9%
10	2311	3.39	9.1	41.1	7.78	95.9%	6.86	91.5%
11	2311	3.87	9.1	36.1	7.80	95.0%	7.43	94.9%
12	2311	2.26	9.1	39.7	7.61	90.6%	7.02	85.8%
Total		35.95	109.20	459.60	91.73		81.26	
Mean		3.00	9.10	38.30	7.64	94.0%	6.77	91.1%

NOTES:

Abbreviations: Precip = precipitation, Est. = estimated, % = percent, NO_3-N = nitrate-nitrogen.

1 Precipitation is actual Nov 1989- Oct 2001 WSU Public Access Weather System (PAWS) Station at Moses Lake.

2 Gross Irrigation = Inches of Process Water and Fresh Water Delivered at irrigation system discharge point (e.g. sprinkler heads). Fresh water loadings are supplemental fresh water to maintain soil water. Fresh water is groundwater irrigate directly to fields not mixed with process water

3 Acreage-weighted mean percolate loss estimated from individual water balances from each field including BAF and Isaac Cox (I/C) Fields.

Cascade Earth Sciences - Spokane
PN: 2621007 / Doc: Modeling Summary BAF ML.stats.xls (Feb Water Balance Summary)

Basic American Foods - Moses Lake
5/1/2006

RESPONSES

Comment #45: The requirement in Section S9.A.8 to describe what measures will be taken to increase the frequency and intensity of soil monitoring in the springtime is based on WSU's review report that BAF is in disagreement with. The vadose zone monitoring system will provide the data that this sampling is meant to address.

Response: Agreed. The narrative in the "Critical Spring time period" section of the Fact Sheet acknowledges that the vadose zone will, in part, evaluate spring-time percolate losses. The requirement in Section S9.A.8 should have been taken out of the Fact Sheet before it was sent out for public review; it will be removed.

Water Balance Summary for Land Application Operations - November Leaching

					Year-Round Land Application		Pond Nov 1- Feb 28	
Year	Acres	Nov- Feb Precip.[1]	Gross Irrigation[2] Process	Fresh	Est. Leaching Fraction[3] inches	Est NO_3-N Leached % Soil NO_3-N	Est. Leaching Fraction[3] inches	Est NO_3-N Leached % Soil NO_3-N
1	2311	0.35	8.8	41.8	8.62	99.2%	7.33	95.2%
2	2311	1.78	8.8	42.0	9.75	98.3%	7.65	96.4%
3	2311	2.23	8.8	42.6	9.57	96.6%	7.55	97.5%
4	2311	2.67	8.8	44.1	9.63	91.6%	7.78	93.0%
5	2311	1.85	8.8	44.6	9.96	98.4%	7.50	96.9%
6	2311	4.44	8.8	38.8	9.74	98.0%	9.15	99.1%
7	2311	4.13	8.8	42.6	11.83	97.4%	8.97	97.9%
8	2311	5.74	8.8	40.7	10.89	93.6%	9.55	94.6%
9	2311	3.24	8.8	29.8	7.41	86.9%	6.84	86.1%
10	2311	3.39	8.8	42.9	9.87	95.4%	8.10	97.3%
11	2311	3.87	9.1	39.9	11.20	97.2%	9.90	98.0%
12	2311	2.26	9.1	40.2	8.13	89.6%	7.61	90.3%
Total		35.95	106.20	490.00	116.60		81.26	
Mean		3.00	8.85	40.83	9.72	95.2%	6.77	95.2%

NOTES:

Abbreviations: Precip = precipitation, Est. = estimated, % = percent, NO_3-N = nitrate-nitrogen.

1 Precipitation is actual Nov 1989- Oct 2001 WSU Public Access Weather System (PAWS) Station at Moses Lake.

2 Gross Irrigation = Inches of Process Water and Fresh Water Delivered at irrigation system discharge point (e.g. sprinkler heads). Fresh water loadings are supplemental fresh water to maintain soil water. Fresh water is groundwater irrigate directly to fields not mixed with process water.

3 Acreage-weighted mean percolate loss estimated from individual water balances from each field including BAF and Isaac Cox (I/C) Fields.

COMMENTS TO SWDP 5213, Basic American Foods

United States Department of the Interior

BUREAU OF RECLAMATION
Ephrata Field Office
P. O. Box 815
Ephrata, Washington 98823

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DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

IN REPLY REFER TO:
EPH-2604
ENV-6.00

Mr. Lenox Bramble
Washington State Department of Ecology
4601 N. Monroe Street
Spokane, WA 99205-1295

Subject: Draft State Waste Discharge Permit No. ST 5213, Basic American Foods, East Columbia Basin Irrigation District, Columbia Basin Project, Washington

Dear Mr. Bramble:

1 In our letter dated July 25, 1997, regarding Basic American Foods prior waste discharge permit, we stated our primary concern was related to the possibility of degrading surface and groundwater from the over-application and leaching of harmful chemicals and nutrients. Based on the information in this latest draft permit and fact sheet, this has become a reality. Therefore, the Bureau of Reclamation must now object to the continued application of wastewater at the current rate to the land described within the draft permit.

The spray field site is located within the Columbia Basin Groundwater Management Area (GWMA). The GWMA includes Franklin, Adams, and Grant Counties (5985 sq. miles). Most residents within the GWMA use groundwater for their potable water source, and groundwater supports an extensive agricultural system. Ecology approved the formation of the GWMA in 1998 with an emphasis on the reduction of nitrate concentrations in the groundwater through the identification and implementation of best management practices. (National Frozen Food Permit ST-8032, 2001)

We agree with the conclusions of the third party technical report which stated that "It is difficult to evaluate the BAF land treatment system as AKART" and "It is not certain that the land treatment system is appropriate for the existing and future beneficial uses of the groundwater in terms of nitrate concentration according to the state's water quality standards (WAC 173-200)." The fact sheet also states that groundwater is in direct continuity with Potholes Reservoir; therefore, surface water standards should also apply to any wastewater discharge in this area. Furthermore, Potholes Reservoir has been listed on the State's 303d list as an impaired water body. Any additional loading to this water body should take that into account.

2 Discharge Limitations
Section S1, The permit states that the spray field system must be operated by the Permittee so as to protect the existing and future beneficial uses of the groundwater and not cause a violation of

RESPONSES

Comment #1: The first three paragraphs in the Bureau's letter are statements that object to the continued application of wastewater, provide a narrative about the GWMA, the Bureau agrees with a third party's evaluation of the site, and the discharge of the ground water from the site to the Potholes Reservoir should be accounted for.

Response: Ecology acknowledges the Bureau's statements. However, none of the statements make a comment on any permit condition. Responding to these statements is outside of the scope of this "Response to Comments" section of the Fact Sheet. Ecology would be most willing to meet with the Bureau to present and discuss all of the information (modeling; ground water data; engineering; risk analysis) that is available for the sprayfield site.

Comment #2: The Bureau believes that the application of 170,500 lbs of nitrogen in the winter will impact ground water. The application of this nitrogen to the I/C fields in the winter constitutes a direct discharge to ground water and is in violation of WAC 173-200 and 372-36.

Response: As explained in the Fact Sheet, the 170,500 lb value is an estimated design value based on the output from the processing facility operating at full capacity; 450,000 lbs. The actual total nitrogen production is much lower; 154,000 lbs in 2004. The current wastewater N load to the I/C fields is much lower than the design value. For 2004, approximately 74,000 lbs of wastewater N was applied to the I/C fields; 40 lbs/acre.

The wastewater nitrogen that is applied is in the ammonia and organic form. Both of these nitrogen forms are immobile in the soils, especially during the cooler winter months. This immobility and the depth to ground water results in no direct discharge to the ground water. As explained in the Fact Sheet and noted by the WSU review report, the highest potential to impact ground water is in the spring time as soil temperatures warm and the nitrogen is converted into the more mobile nitrate form. The permit requirement to install a vadose zone monitoring system will help determine nitrogen loss from the root zone during the growing and winter seasons.

In addition, the ground water data and modeling can not distinguish if the impacts to the ground water, other than the plume from the old BAF fields, are due to application of process wastewater or from the addition of commercial fertilizers that is part of the production agriculture that has been and is happening at the I/C site.

COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES
  the groundwater standards (WAC 173-200). It is our opinion that the application of approximately 38 percent of the annual total or 170,500 lbs of nitrogen during the winter months will impact groundwater. The process of land application of wastewater to crops is for the treatment of the wastewater through plant uptake of nutrients. The application of wastewater to the I/C fields in the winter months constitutes direct discharge to groundwater and is a violation of both Chapter 173-200 and Chapter 372-36 of the Washington Administrative Code (WAC). Enforcement Limits The Fact Sheet states on page 16 that: "1. ...Nitrate concentrations in these wells are high. The average values for MW6, 9, 10, and 13 range from 32.8 – 52.5 mg/L. This is above the current groundwater standards of 10 mg/L. If this is truly the case, then no additional nitrate load should be allowed over the groundwater plume and a cleanup action plan should be develop and implemented immediately. Furthermore, on page 17 it is stated that enforcement limits will not be included with this permit, rather they will be revisited when the next permit is issued. Instead of enforcement limits, changes will be required in the management of the spray field site and spray field reporting requirements in the permit. We strongly recommend that Basic American Foods be required to stop non-irrigation season application of their wastewater and be required to pond that wastewater and apply only during the growing season for treatment of the nutrient load. We consider any other type of discharge to be disposal of waste materials and this permit does not adequately address wastewater treatment for disposal to groundwater or surface water. Irrigated Process Wastewater Monitoring Section S2 A., The permit states that samples will be taken from a point that is representative of what is being spray irrigated. We would suggest that a sampling point at the processing plant be stated for compliance monitoring of the wastewater. If it is found at this point that the wastewater does not meet discharge requirements, it could be stopped or redirected to a holding facility for additional treatment prior to discharge. The Fact Sheet states on page 18 that: "To gain a better understanding of the organic load to the spray fields, soluble BOD testing of the irrigated wastewater will be required for one year. The results of both soluble and total BOD testing for the year will be presented to Ecology in a report." We recommend that this testing period be extended to three years to account for variation in loading from year to year. Soil Monitoring Section S2. D., The current requirement for soil monitoring requires two samples to be collected during the irrigation season. If the practice of land application during the non-irrigation season continues, we request that two additional like samples to taken during this time frame to determine the loading to each field utilized. The Fact Sheet states on page 20 that; "1. a. Cation exchange capacity (CEC) will replace 'soil moisture' because the moisture content changes continuously and a one time sample, twice per year, gives limited long-term information." We recommend that the sampling frequency remain at the current quarterly sampling.	Comment #3: Page 16 of the Fact Sheet notes that the nitrate concentrations in the ground water at MW6, 9, 10, and 13 are high. If this is true, no additional nitrates should be allowed over the ground water plume and a clean up action plan should be required. Response: As explained in the Fact Sheet, BAF has submitted engineering, modeling, and a risk analysis report that support their contention that applying wastewater on this site as per the current operational schedule (BAF fields in the summer; I/C fields in the winter) has the same level of ground water protection as does applying only during the growing season. Ecology is in the process of evaluating this information and making a decision on its acceptance. Not allowing any additional nitrates (nitrogen) over the ground water plume would result in the diversion of the entire wastewater volume to a limited amount of acres and hydraulically over load the system. With regards to a clean up plan, consideration would be given if clean up plans were required for the general agriculture industry in the basin that has caused high nitrate concentrations in the ground water throughout the irrigation project. Comment #4: . The Bureau strongly recommends that BAF be required to stop non-irrigation season application of the wastewater, and be required to pond the wastewater. Applying wastewater during the non-growing season is disposal and not treatment. Response: Ecology's recently adopted guidance for land treatment systems allows site specific demonstrations of innovative approaches to achieving the treatment of nitrogen during the non-growing season. The proponent must demonstrate that their system is equivalent in protecting the ground water as is by applying only during the growing season. BAF has provided information to Ecology that supports their innovative approach for this location. Additional information will be provided by the requirements in the proposed permit; e.g., vadose zone monitoring. Until sufficient information and data is available that clearly shows if the operations of BAF's current land treatment system is impacting ground water, Ecology will continue to require BAF to gather information until a determination can be clearly made on whether or not to require the storage of process wastewater during the winter non-growing season.

COMMENTS TO SWDP 5213, Basic American Foods

Groundwater Monitoring
The Fact Sheet states on page 20 that; "The testing for the list of cations and anions will be changed from 'quarterly' to 'once per year'." Because of the concerns with the current condition of the ground in the area of the spray field, we do not agree with a reduction in sampling frequency. We would rather see an increase to monthly sampling.

Records Retention
S3 B., We request that records be retained for the permit cycle so that all information pertaining to the permit can be reviewed for compliance and to determine if additional changes are necessary.

In conclusion, we are very concerned with the continued application of wastewater to the area described in the draft permit without the improvement of groundwater quality. As stated in the Fact Sheet, the groundwater in this area is in direct hydraulic continuity with Potholes Reservoir, the primary source of irrigation water for the South Columbia Basin Irrigation District, plus fish and wildlife, recreation and additional municipal and industrial uses downstream.

If you have any questions, please contact Bruce Loranger at 509-754-0210.

Sincerely,

William D. Gray
Deputy Area Manager

cc: Ms. Elayne Fuller
East Columbia Basin Irrigation District
P.O. Box E
Othello, WA 99334

South Columbia Basin Irrigation District
P.O. Box 1006
Pasco, WA 99301

RESPONSES

Comment #5: Section S2.A of the permit requires that samples be taken that is representative of what is being spray irrigated. It is suggested that a sampling point be established at the processing plant for compliance purposes.

Response: Composite samples of the effluent have been and are collected just downstream of the in-line filter which is located at the processing facility site. The flow meter is also located at the processing facility. The only daily effluent limit is for maximum flow (1.66 MGD). All other limits are average monthly or total annual limits. An exceedance of the daily max flow limit would be a permit violation, but its impact would be minimal given the expanse of the sprayfield system. The high flow would result in a transitory

Comment #6: It is recommended that soluble BOD testing be done for three years instead of one.

Response: Ecology's permit writer's manual provides guidance on establishing monitoring frequency for permits. Using the recommended confidence level of 90%, a relative error of 20%, and a coefficient of variation of 0.6 for baseline monitoring, approximately 15 samples would be required to characterize the soluble BOD in the effluent. To provide a margin of confidence, the permit will require 18 samples.

The permit will be changed to extend the soluble BOD sampling for an additional six months. The sampling frequency of 1/month will be for 18 months. The footnote in Section S2.A will be changed to show the following:

> [3] Testing will be done for ~~12~~ **18** consecutive months, beginning in July 2006. See Section S3.G for reporting requirements.

Comment #7: The Bureau requests that the two additional soil samples be collected during the non-growing season to determine loading to each field utilized.

Response: Please note that changes have been made to the soil sampling requirements in the permit in response to BAF's consultant's recommendation; comment #34.

The 2/year soil samples are generally collected in March to show the soil nutrient load

COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES
	going into the growing season, and in November/December to indicate what residual was carried over at the end of the growing season. Nutrient loading to the fields is measured for all months. In addition, a vadose monitoring system will be installed to measure any leachate that escapes the root zone. It is not known what two additional soil sampling events will provide in terms of field management, given the current permit testing requirements. Two additional soil testing samples will not be added to the permit. Comment #8: Page 20 of the Fact Sheet shows that the CEC soil test will replace the soil moisture. The Bureau recommends that the sampling frequency remain at the current quarterly sampling. Response: It is uncertain what the comment is referring to when it recommends the sampling frequency remain at "..the current quarterly sampling." There was no quarterly soil monitoring requirements in the previous permit, nor is there quarterly monitoring in the proposed permit. The elimination of soil monitoring in Section S2.D did not eliminate its testing at the sprayfield site. Section S4.D (Best Management Practices) requires at least weekly monitoring of the soil profile to help manage irrigation on the fields. Comment #9: On page 20 of the Fact Sheet it is stated that anion and cation testing of the ground water will be reduced from quarterly to once per year. Because of the concerns with the current condition of the ground water, the Bureau recommends that the testing be increased to monthly. Response: Quarterly cation and anion testing, and data submittal for the ground water at the sprayfield site has occurred since 1993. Ecology believes that a sufficient data base has been generated to characterize the ground water, and 1/year monitoring is adequate to supplement this data base. In addition, the only ion with a ground water standard is chloride; 250 mg/L. Average chloride concentrations in the downgradient wells (MW6,9;10,13) range from 21 to 117 mg/L. If there is an unexpected increase in one of the ions in the ground water due to the sprayfield operations, it will most likely manifest itself in the "fixed dissolved solids"

COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES
	test parameter that is done monthly. Comment #10: It is requested that Section S3.B of the permit require that records be kept for the entire permit cycle. Response: The general boiler plate language in Section S3.B is based on delegated state NPDES permit regulation language; WAC 173-220-210. Ecology retains all reports and monitoring data for well over two permit cycles. From reports submitted by BAF to Ecology, it is apparent that BAF retains copies of records and monitoring data for more than one permit cycle. There is no evidence to support asking BAF to retain records for more than the regulatory requirement. Comment: The Bureau is very concerned with the continued application of wastewater to the area. The ground water is in direct continuity with the ground water that discharges to the Potholes Reservoir that serves as the source of irrigation water as well as wildlife habitat. Response: Ecology shares the Bureau's concern for the protection of the ground water beneath the sprayfield site. That is why BAF has been required to provide engineering, ground water modeling, and a risk analysis. In addition, the proposed permit will require the installation of a vadose zone monitoring system to "ground truth" estimated nitrate leaching fractions and get a better understanding of the water balance at the site. The new permit requirement to use and report petiole testing will help manage nitrogen loading, as well as the requirement to compare design and estimated nitrogen, salt, and water loadings to actual values will help determine BAF's compliance with the agronomic rate limitation which is a major part of providing AKART for the wastewater. There is no doubt that BAF's old original sprayfields have impacted ground water. What must be determined is whether or not the operations of the existing sprayfield site is impacting ground water, while recognizing the time necessary for wastewater nutrients to travel to the already impacted ground water, the time necessary for travel to a monitoring well, and that most of the fields have been used and continue to be used for production agriculture which has, in general, caused elevated nitrates in the ground water throughout the irrigation project due to the over application of fertilizers.

COMMENTS TO SWDP 5213, Basic American Foods	RESPONSES
	Regarding the direct discharge of the ground water beneath the site to the Potholes Reservoir. The statement made in the Fact Sheet concerning direct continuity was taken from BAF's hydrogeologic report, which was based on indirect evidence (soil conditions; water level elevations). Recent court rulings require that pollutants must be traced from their source to surface waters, in order to come within the purview of the Clean Water Act; i.e., direct evidence. If and when it is determined that the nutrients from the BAF wastewater is directly discharging to the Potholes Reservoir, then it can be considered as part of all other point and non-point contributors of nutrients to the Potholes Reservoir and be part of a TMDL for this 303(d) listed waterbody. Ecology will continue to work with BAF to determine if the existing site is protective of the ground water. This is consistent with Ecology's guidance to evaluate alternative land treatment methods on a site specific, case-by-case basis. The extended time it takes for relatively recent changes in land use activities at the site to be manifested in ground water that has already been impacted unfortunately makes the process of evaluating the site as AKART challenging. It is Ecology's intent to condition the proposed permit to refine the management of the site, and to provide monitoring data that will allow for the continuous monitoring of its impacts to the soils and ground water.

Basic American Foods – Approximate Permit Actions Timeline

	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2006					Issue permit		I/C fields flow measurement					Vadose Zone Plan
2007	Spill Plan - Update		Sol. BOD testing report	Irrig/Crop Plan								
2008				Irrig/Crop Plan								
2009				Irrig/Crop Plan								
2010				Irrig/Crop Plan					Permit App.			
2011				Irrig/Crop Plan								

Fig. 1. BAF sprayfield site

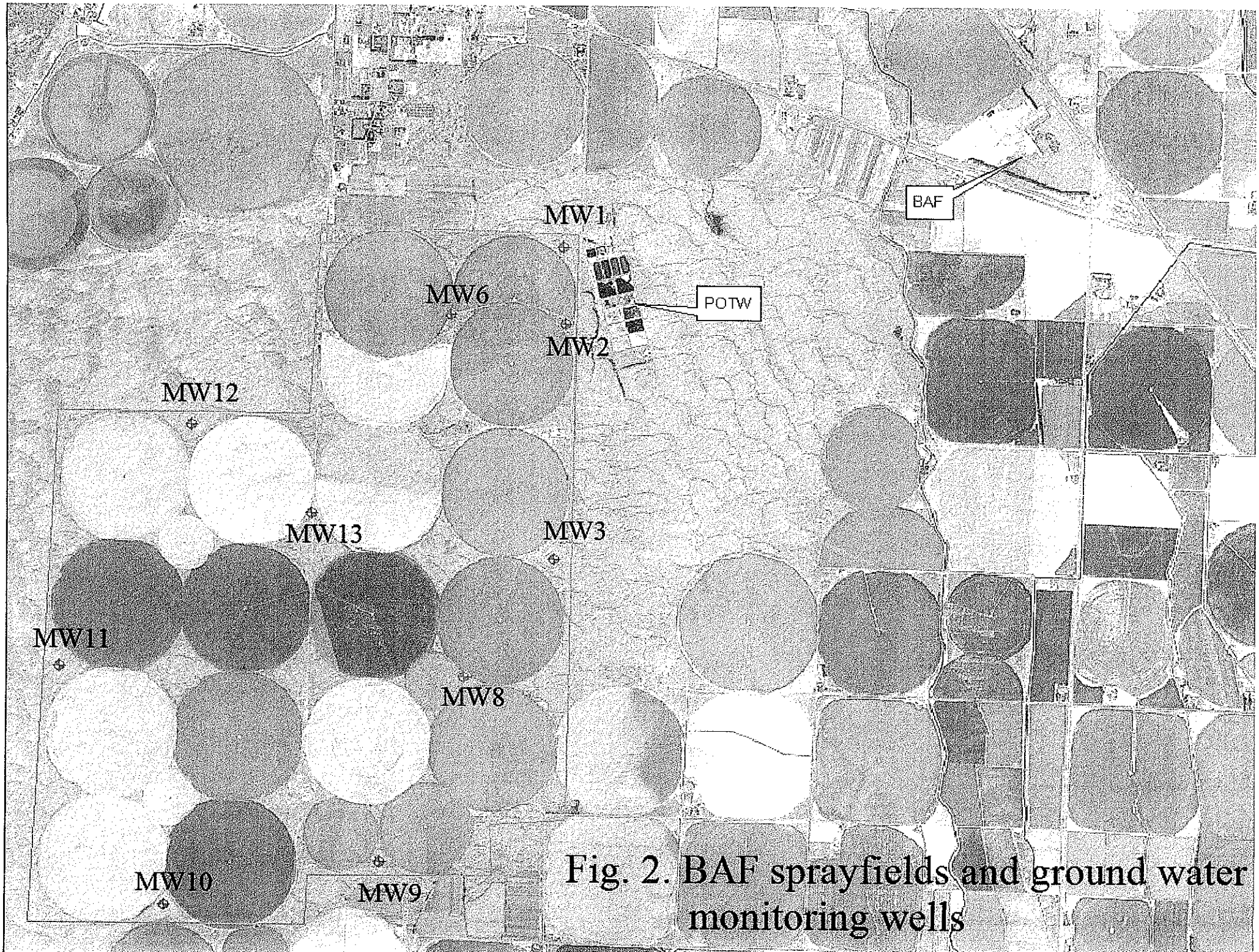
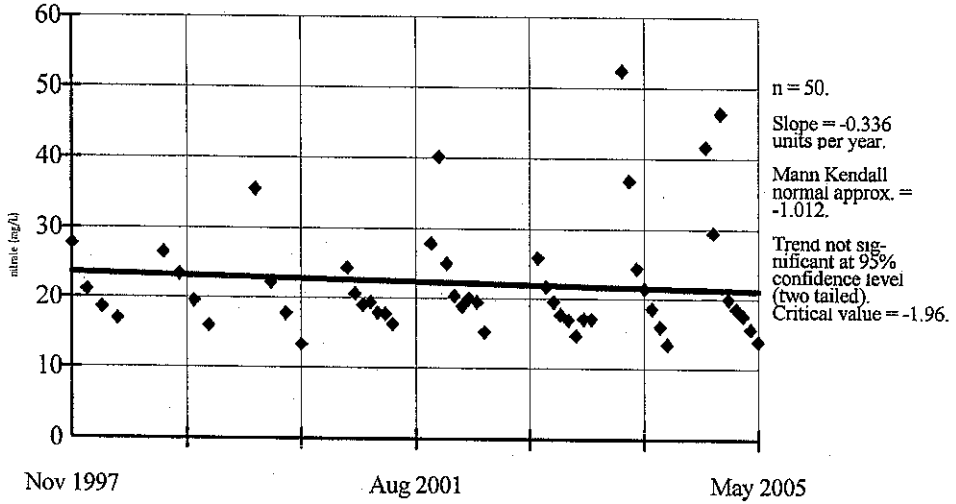


Fig. 2. BAF sprayfields and ground water monitoring wells

SEN'S SLOPE ESTIMATOR
MW11



Constituent: nitrate (mg/L) Facility: Discharger Data File: BAF Downgradient(96-05)
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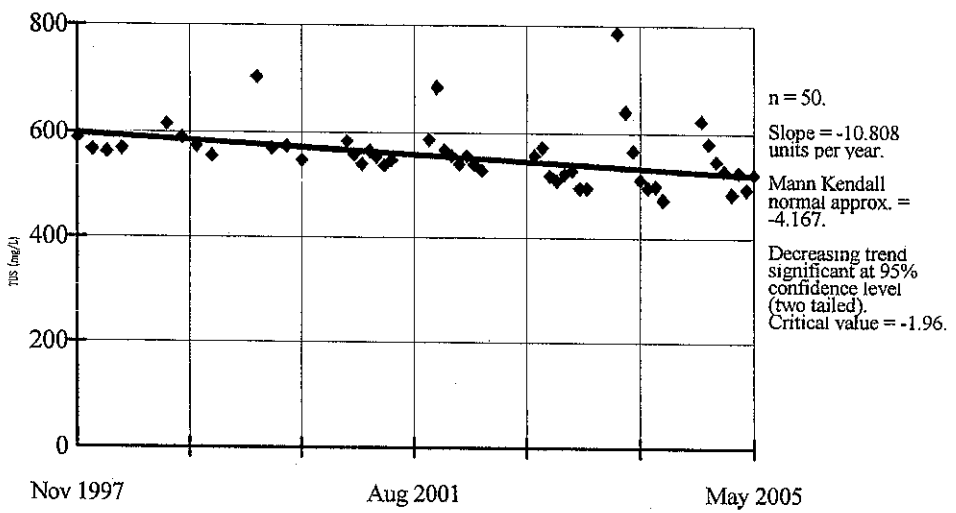
SEN'S SLOPE ESTIMATOR
MW11



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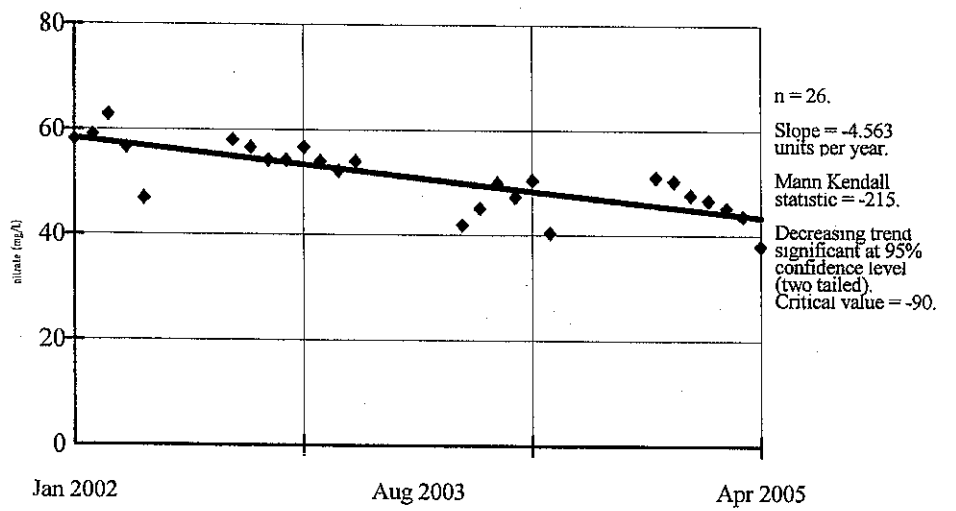
SEN'S SLOPE ESTIMATOR
MW13



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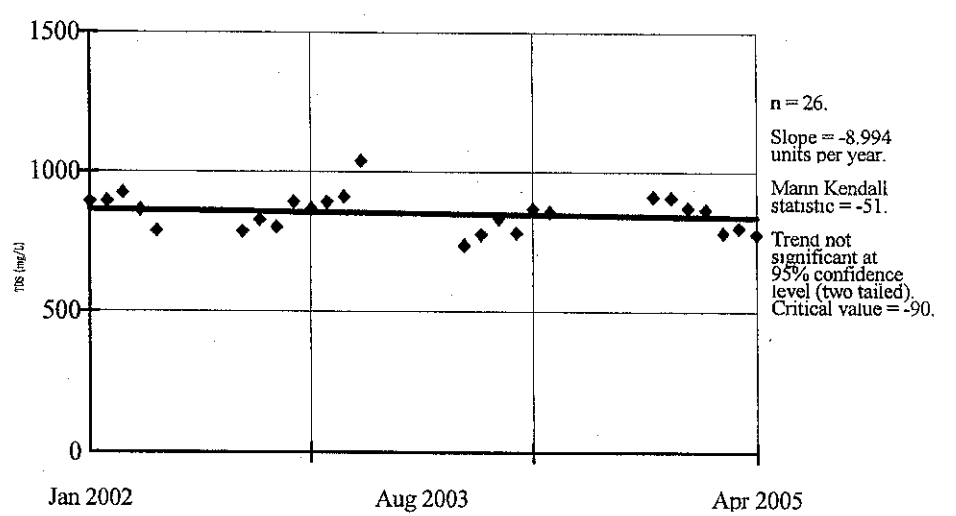
SEN'S SLOPE ESTIMATOR
MW13



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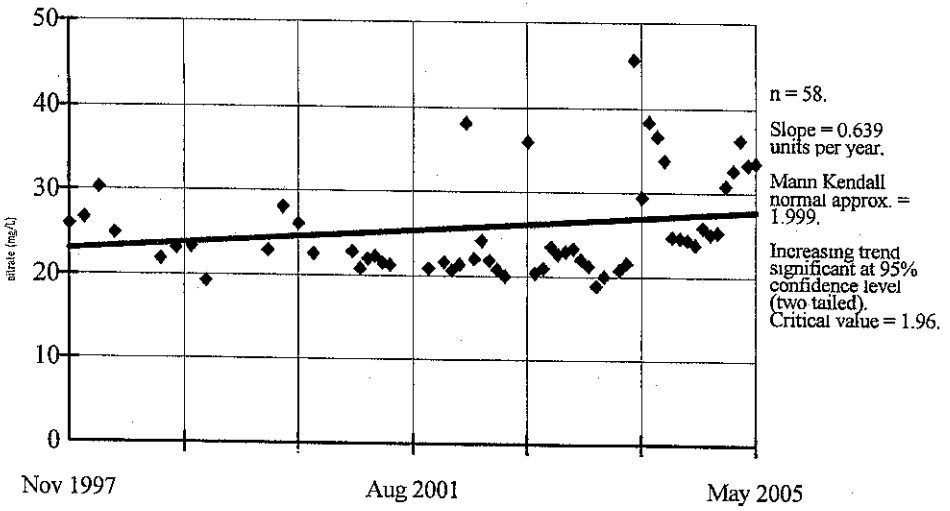
SEN'S SLOPE ESTIMATOR
MW9



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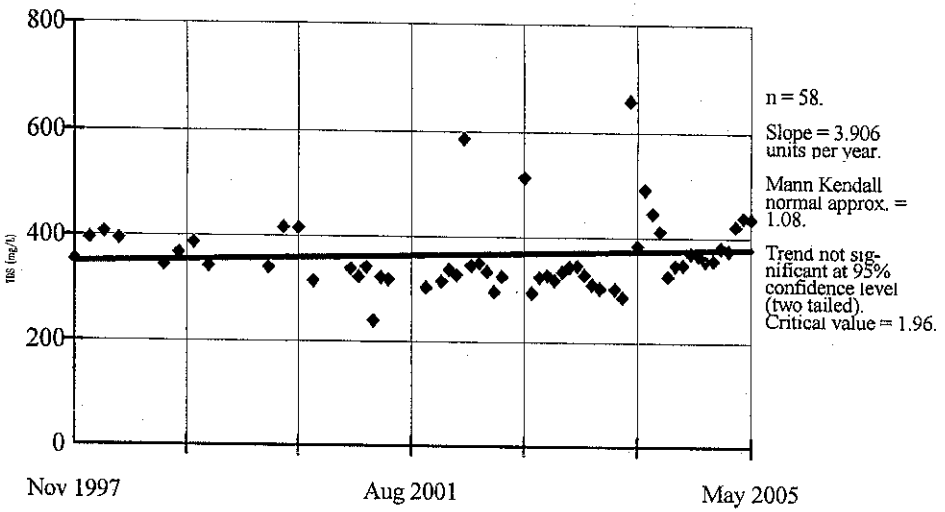
SEN'S SLOPE ESTIMATOR
MW9



Constituent: TDS (mg/L) Facility: Discharger Data File: BAF Downgradient(96-05)
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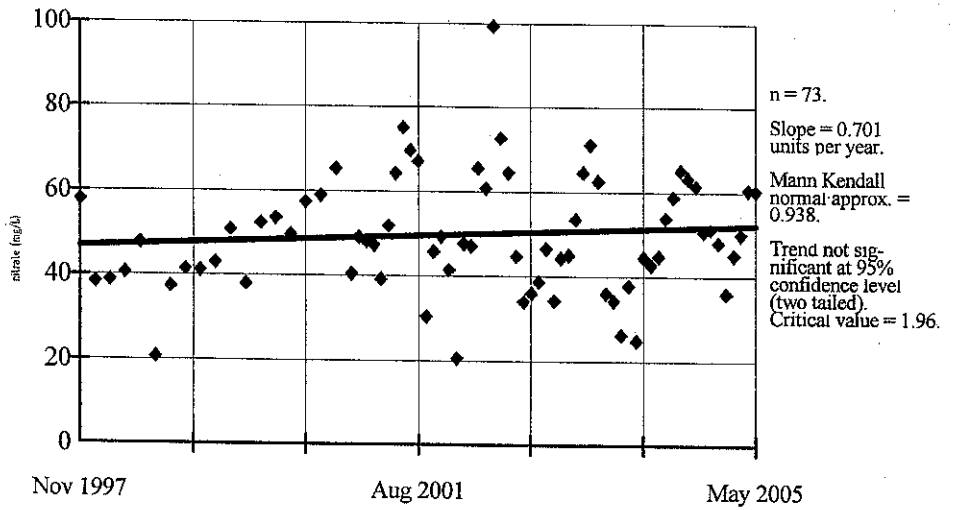
SEN'S SLOPE ESTIMATOR
MW10



Constituent: nitrate (mg/L) Facility: Discharger Data File: BAF Downgradient(96-05)
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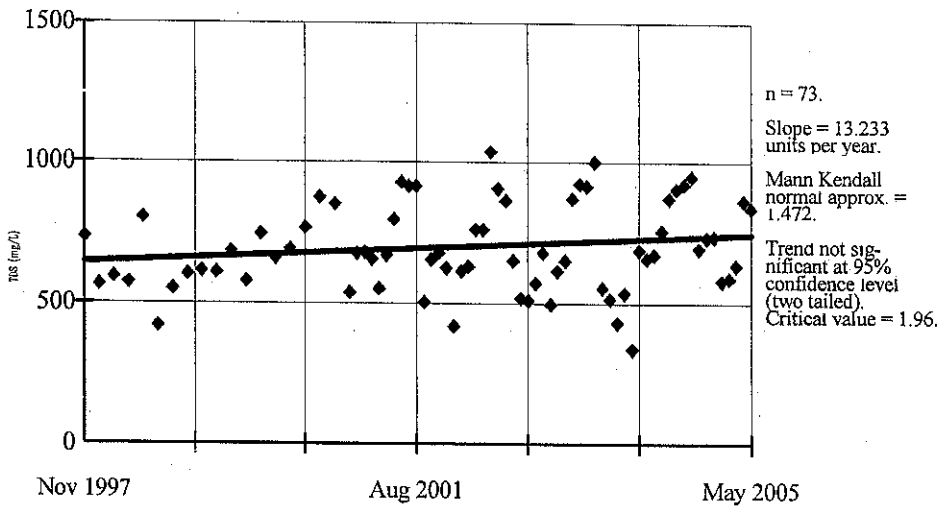
v.8.6.005. FOR USE BY STATE REGULATORS ONLY. EPA

SEN'S SLOPE ESTIMATOR
MW10



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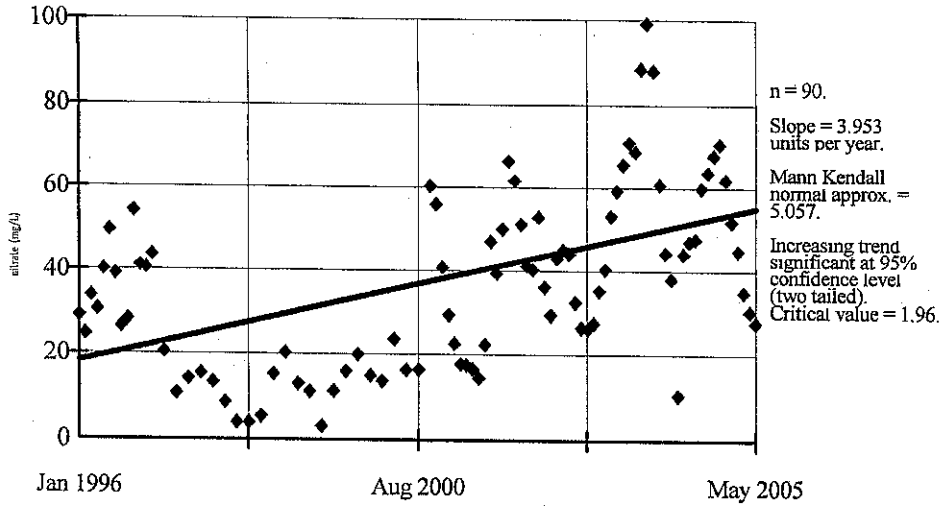
SEN'S SLOPE ESTIMATOR
MW6



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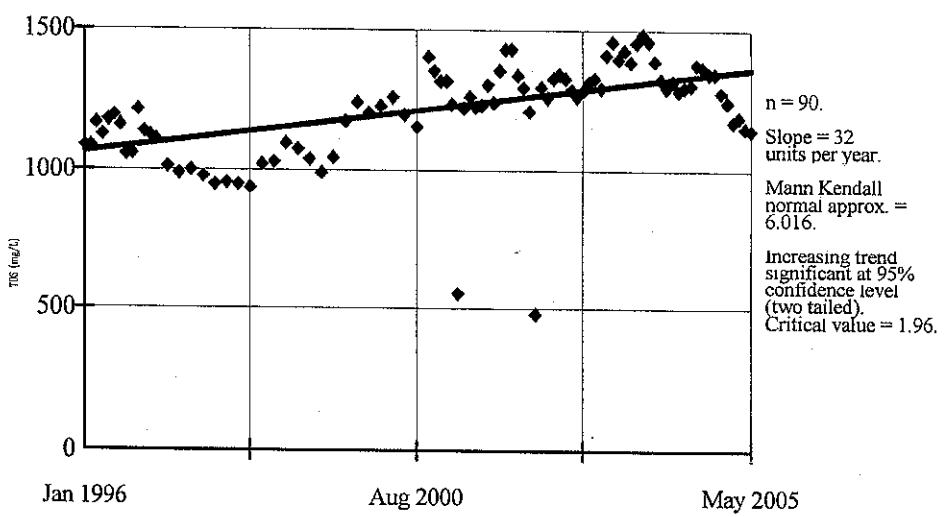
Date: 3/6/06, 3:47 PM Client: Regulatory Use Only View: BAF downgradient

v.8.6.005. FOR USE BY STATE REGULATORS ONLY. EPA

SEN'S SLOPE ESTIMATOR
MW6



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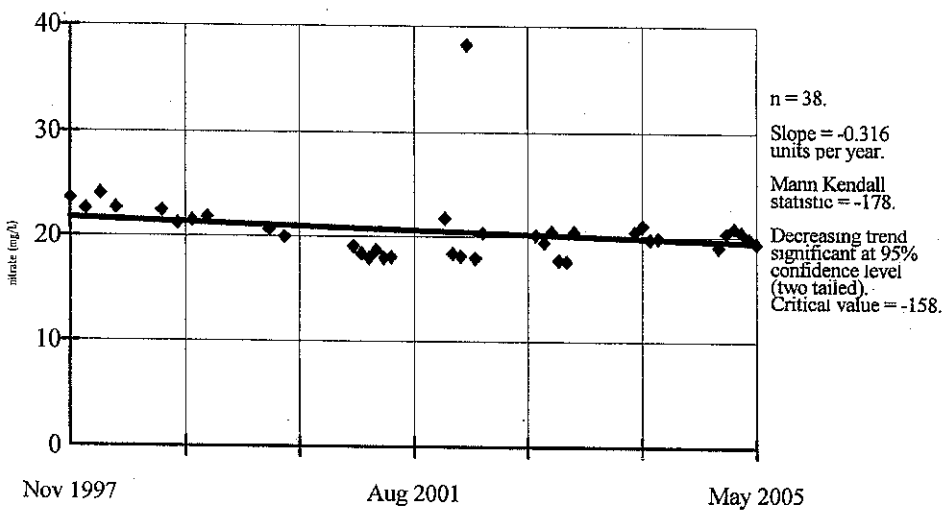
v.8.6.005. FOR USE BY STATE REGULATORS ONLY. EPA

SEN'S SLOPE ESTIMATOR
MW8



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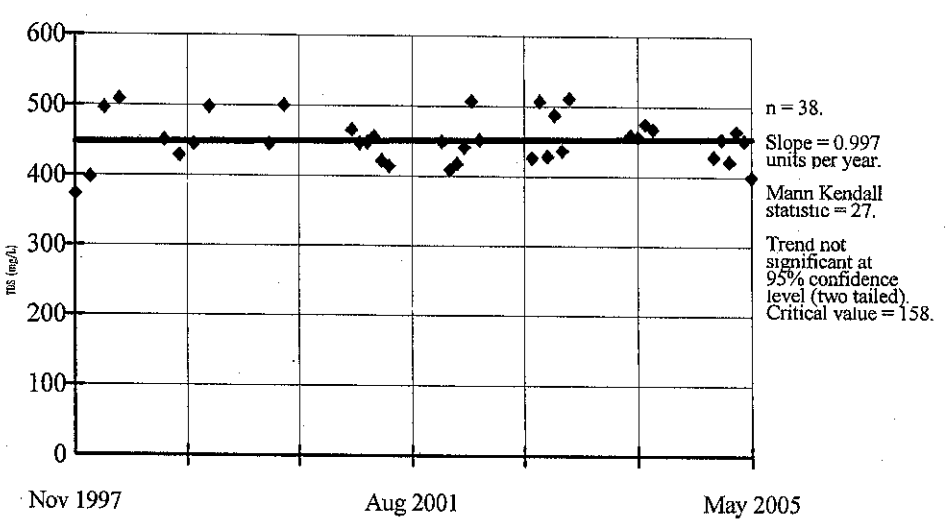
v.8.6.005. FOR USE BY STATE REGULATORS ONLY. EPA

SEN'S SLOPE ESTIMATOR
MW8



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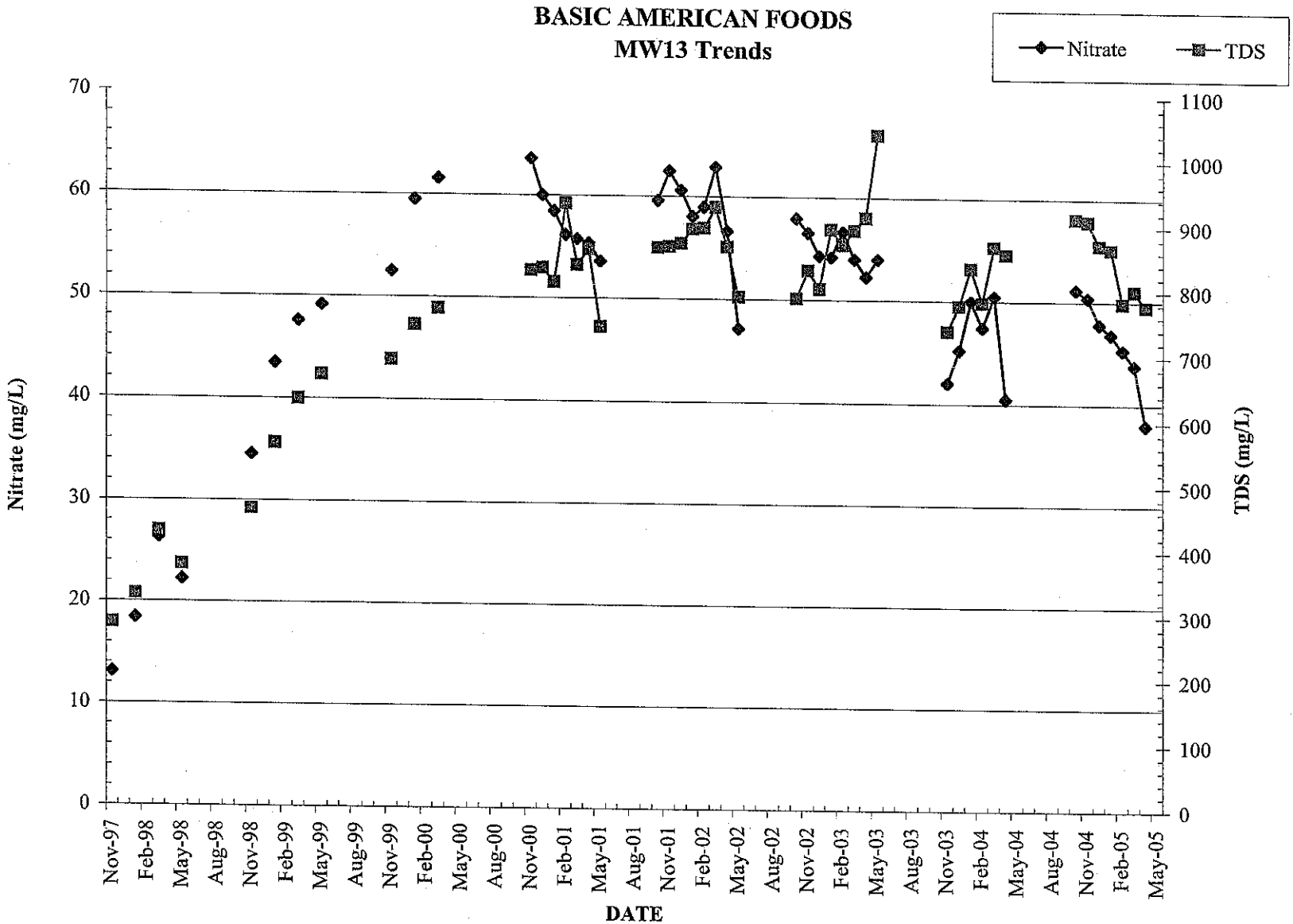
BASIC AMERICAN FOODS
MW13 Trends
Nitrate
TDS
Nitrate (mg/L)
TDS (mg/L)
DATE
0
10
20
30
40
50
60
70
0
100
200
300
400
500
600
700
800
900
1000
1100
Nov-97
Feb-98
May-98
Aug-98
Nov-98
Feb-99
May-99
Aug-99
Nov-99
Feb-00
May-00
Aug-00
Nov-00
Feb-01
May-01
Aug-01
Nov-01
Feb-02
May-02
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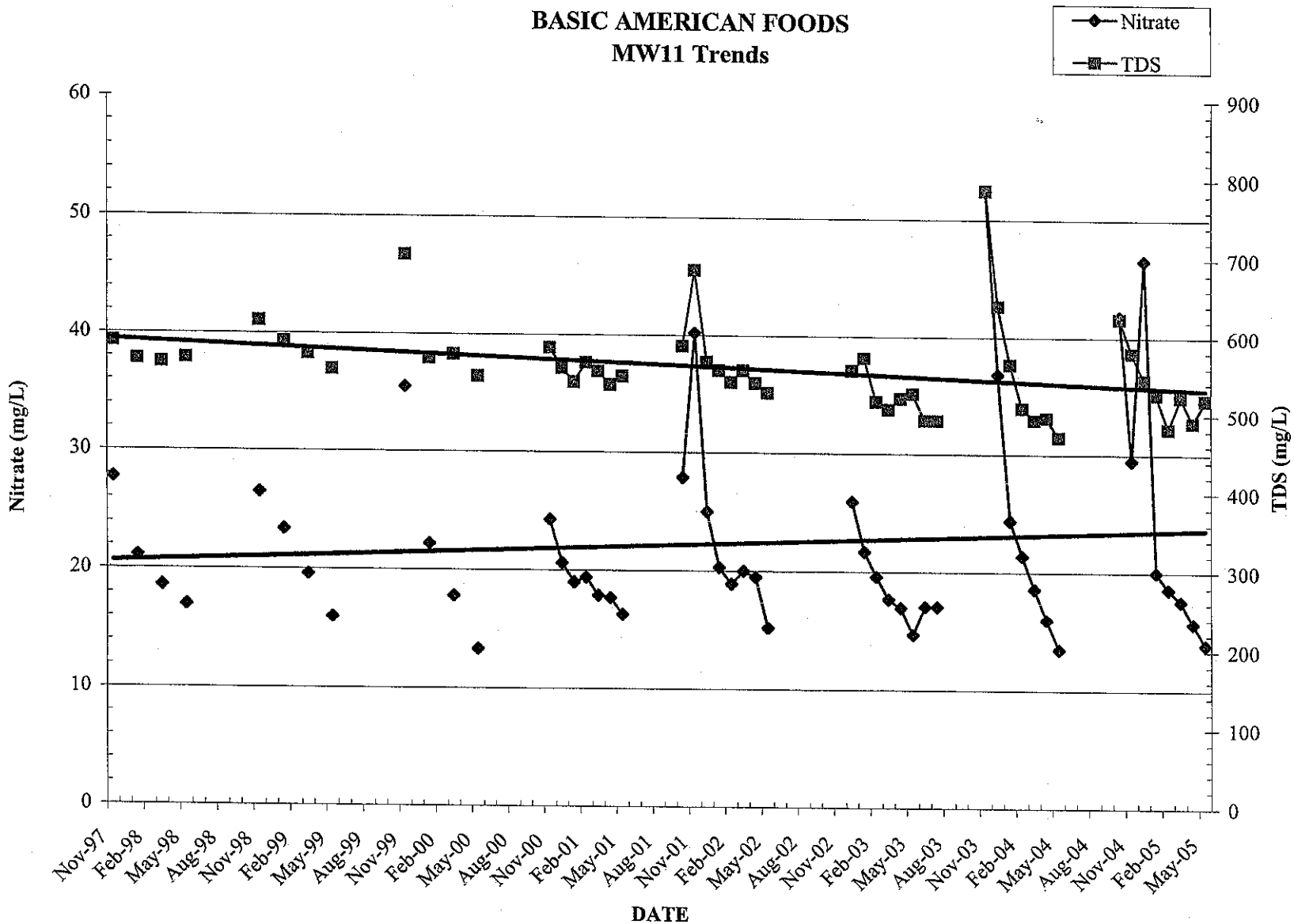
Feb-04
May-04
Aug-04
Nov-04
Feb-05
May-05


BASIC AMERICAN FOODS
MW11 Trends
Nitrate
TDS
Nitrate (mg/L)
TDS (mg/L)
DATE
0
10
20
30
40
50
60
100
200
300
400
500
600
700
800
900
Nov-97
Feb-98
May-98
Aug-98
Nov-98
Feb-99
May-99
Aug-99
Nov-99
Feb-00
May-00
Aug-00
Nov-00
Feb-01
May-01
Aug-01
Nov-01
Feb-02
May-02
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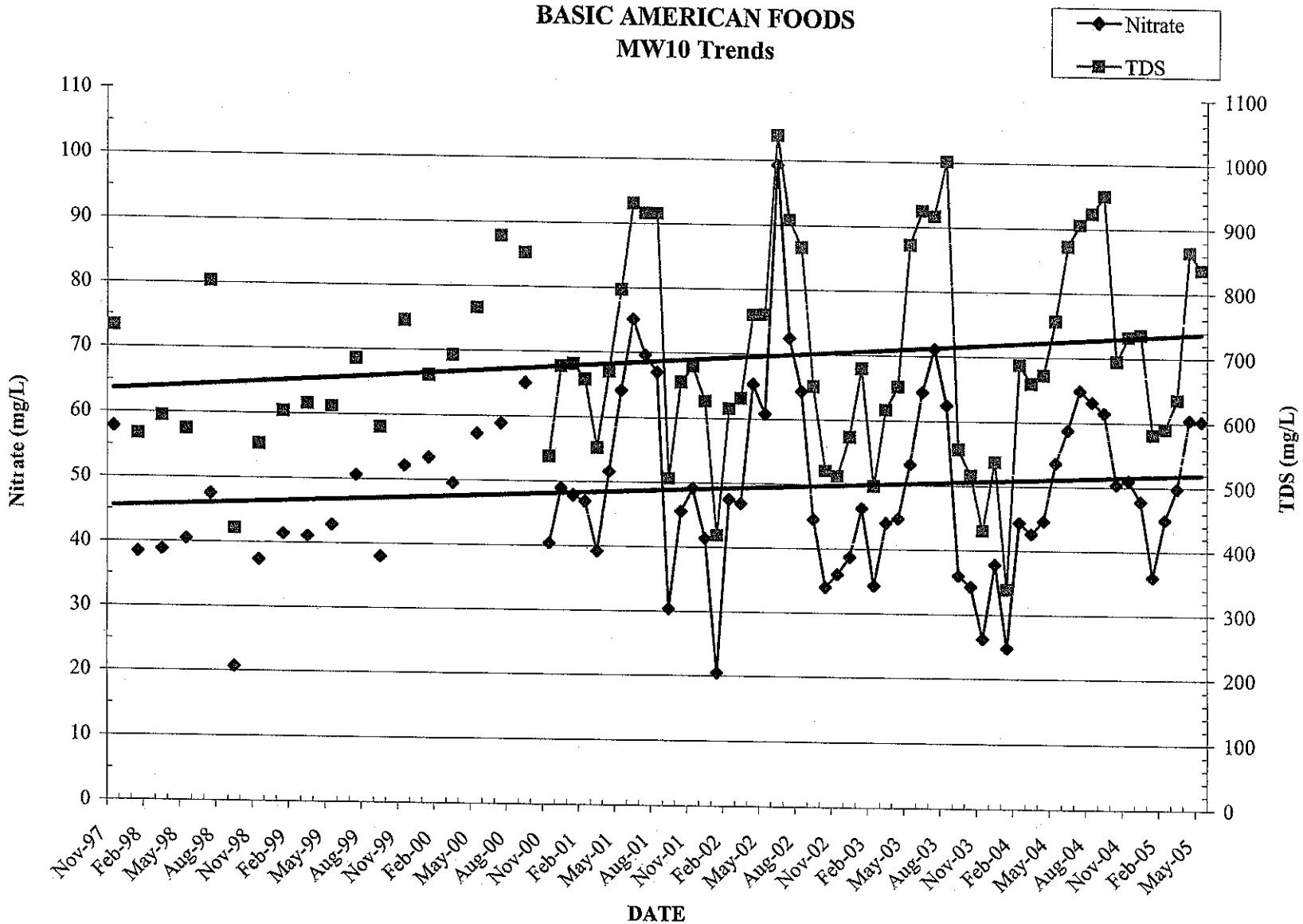
Feb-04
May-04
Aug-04
Nov-04
Feb-05
May-05


BASIC AMERICAN FOODS
MW10 Trends
Nitrate
TDS
Nitrate (mg/L)
TDS (mg/L)
DATE
110
100
90
80
70
60
50
40
30
20
10
0
1100
1000
900
800
700
600
500
400
300
200
100
0
Nov-97
Feb-98
May-98
Aug-98
Nov-98
Feb-99
May-99
Aug-99
Nov-99
Feb-00
May-00
Aug-00
Nov-00
Feb-01
May-01
Aug-01
Nov-01
Feb-02
May-02
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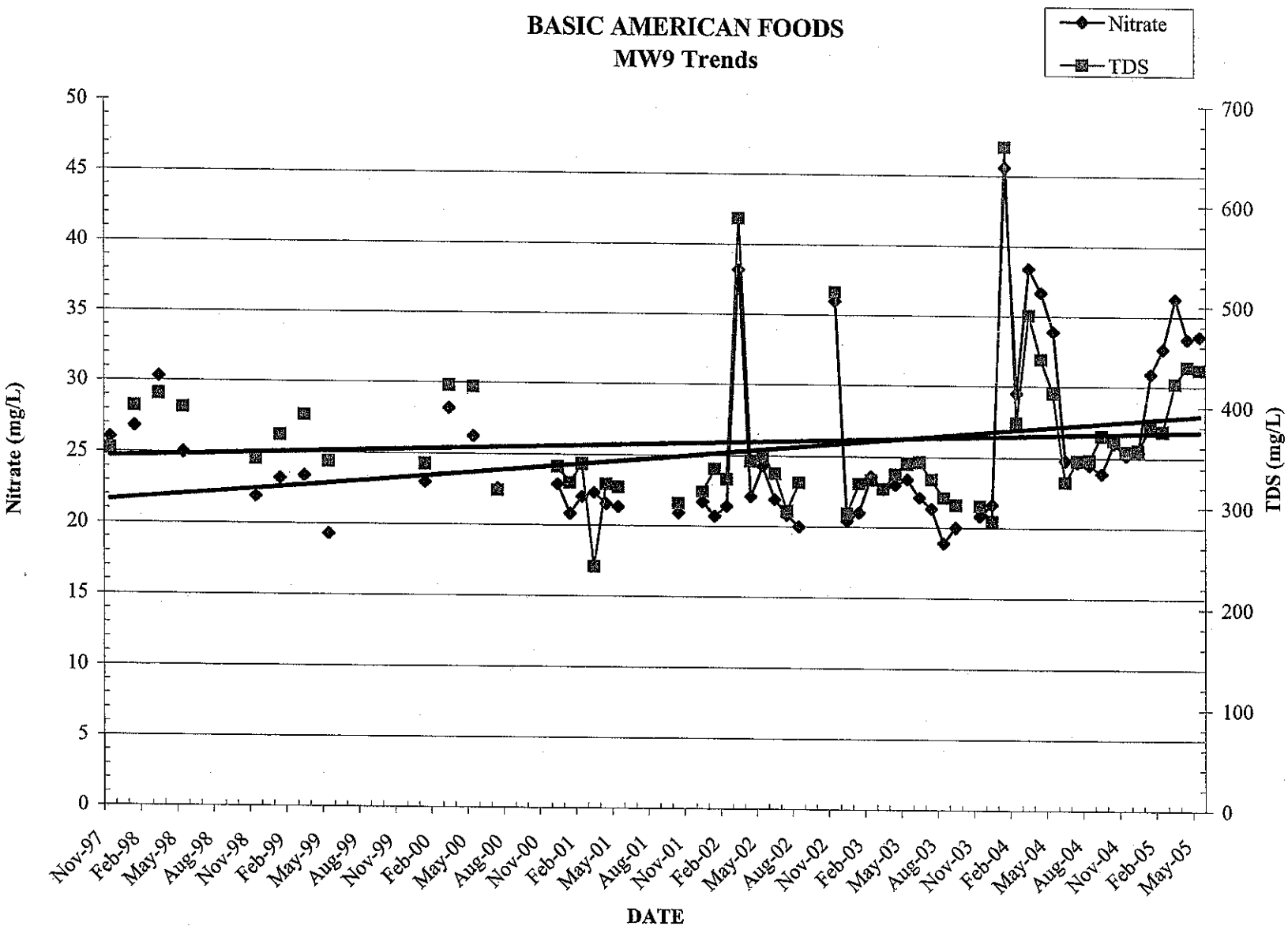
May-04
Aug-04
Nov-04
Feb-05
May-05


BASIC AMERICAN FOODS
MW9 Trends
Nitrate
TDS
Nitrate (mg/L)
TDS (mg/L)
DATE
0
5
10
15
20
25
30
35
40
45
50
0
100
200
300
400
500
600
700
Nov-97
Feb-98
May-98
Aug-98
Nov-98
Feb-99
May-99
Aug-99
Nov-99
Feb-00
May-00
Aug-00
Nov-00
Feb-01
May-01
Aug-01
Nov-01
Feb-02
May-02
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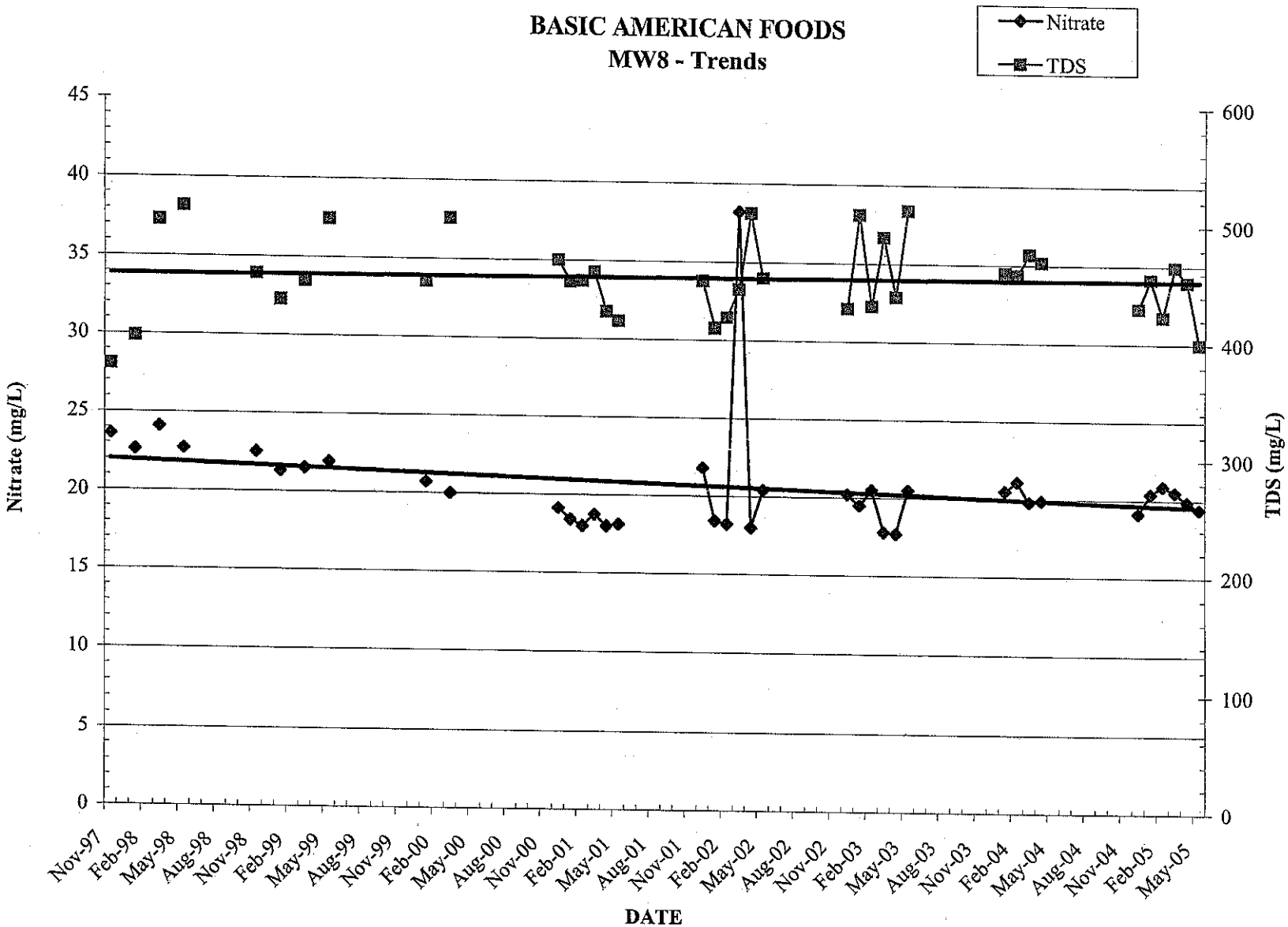
May-04
Aug-04
Nov-04
Feb-05
May-05


BASIC AMERICAN FOODS
MW8 - Trends
Nitrate
TDS
Nitrate (mg/L)
TDS (mg/L)
DATE
0
5
10
15
20
25
30
35
40
45
0
100
200
300
400
500
600
Nov-97
Feb-98
May-98
Aug-98
Nov-98
Feb-99
May-99
Aug-99
Nov-99
Feb-00
May-00
Aug-00
Nov-00
Feb-01
May-01
Aug-01
Nov-01
Feb-02
May-02
Aug-02
Nov-02
Feb-03
May-03
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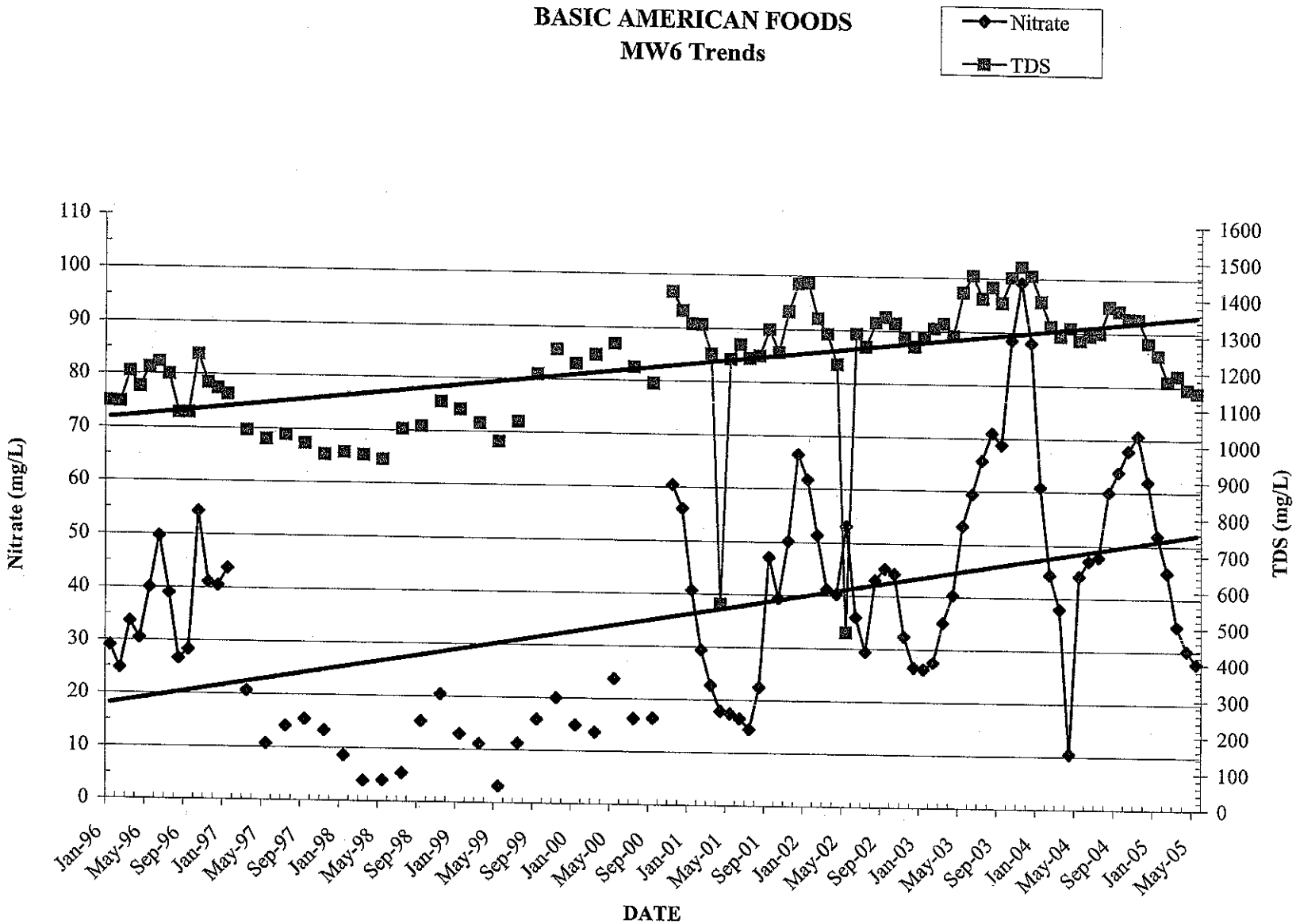
Feb-04
May-04
Aug-04
Nov-04
Feb-05
May-05

BASIC AMERICAN FOODS
MW6 Trends



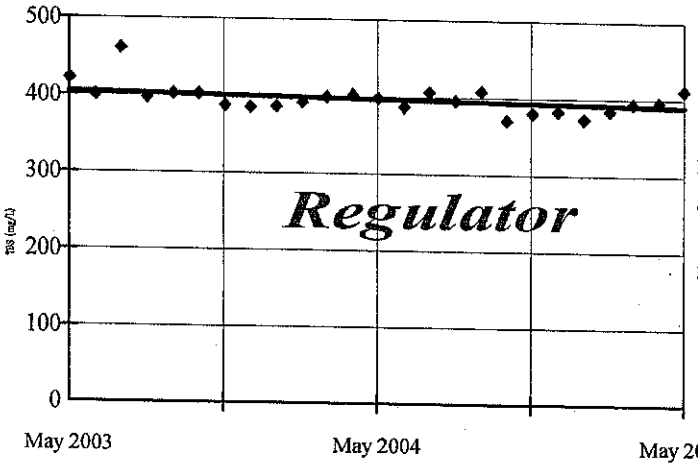
ADDENDUM 3

Downgradient Ground Water Analysis

TDS

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

SEN'S SLOPE ESTIMATOR
MW12



n = 25.

Slope = -7.192 units per year.

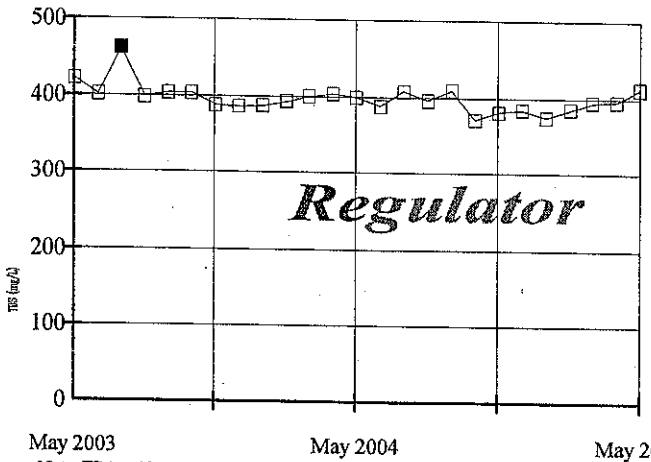
Mann Kendall statistic = -73.

Trend not significant at 95% confidence level (two tailed). Critical value = -85.

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW12(01-05)
Date: 9/9/05, 11:47 AM Client: Regulatory Use View: BAF-MW12(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

OUTLIER ANALYSIS
MW12



Log-transformed:
Mean = 5.985, after outlier removal 5.978.
Std. Dev. = 0.04299, after outlier removal 0.03044.
Critical Tn = 2.663, after outlier removal 2.644.

Statistical outliers are shown as solid squares. Data, after outlier removal, were found to be normally distributed.
Normality test used: Shapiro Wilk.
W Statistic = 0.9873
W Quantile = 0.916

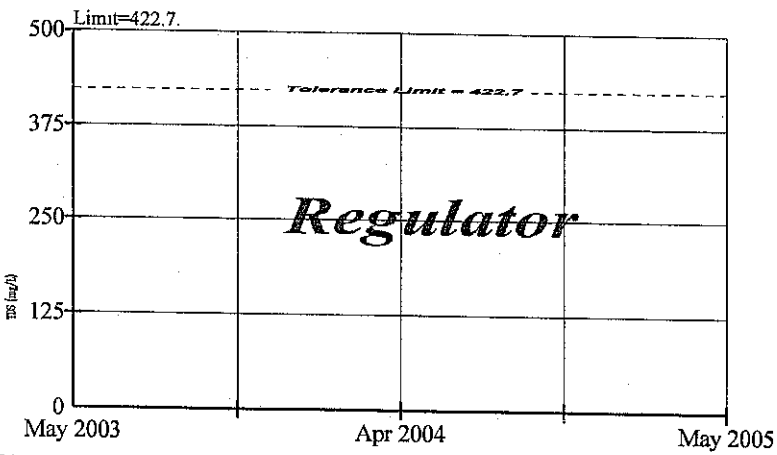
Remove 7/03 outlier

Note: EPA guidance directs that statistical outliers should not be removed or altered unless independent evidence of an error exists.

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW12(01-05)
Date: 9/9/05, 11:48 AM Client: Regulatory Use View: BAF-MW12(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

PARAMETRIC INTRA-WELL TOLERANCE LIMIT
MW12



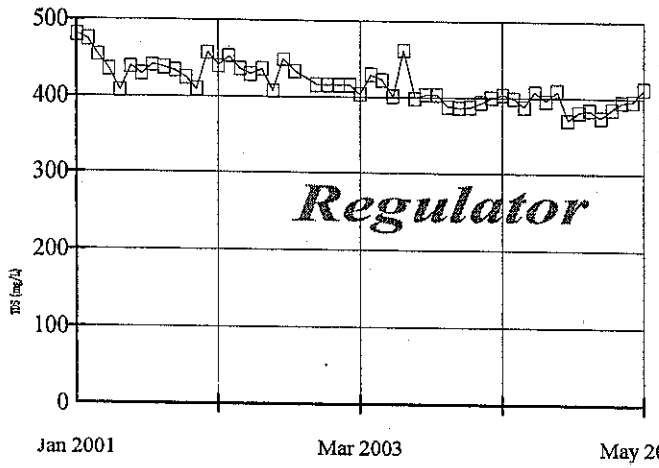
95% coverage. Background Data Summary: Mean=395, Std. Dev=12.01, 0% nds, 24 obs. Normality test used: Shapiro Wilk. W for background data = 0.9873, W Quantile = 0.916. Testwise alpha = 0.05.

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW12(01-05)
Date: 9/9/05, 11:49 AM Client: Regulatory Use View: BAF-MW12(01-05)

TDS

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

OUTLIER ANALYSIS
MW12



Log-transformed:
Mean = 6.028.
Std. Dev. = 0.06081.
Critical Tn = 2.971.

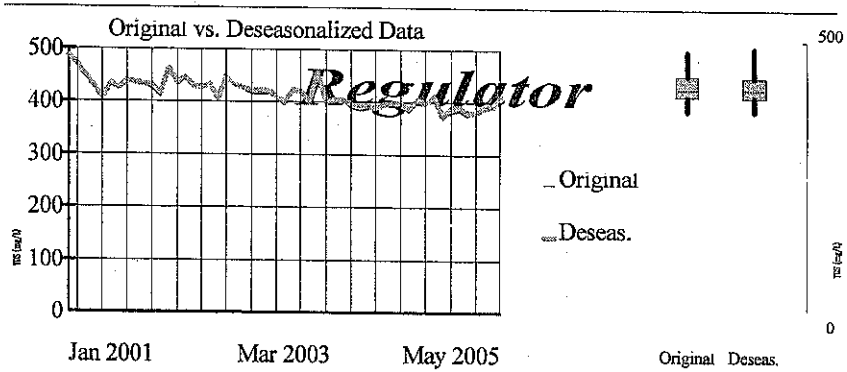
No statistical outliers are present.
Data were found to be normally distributed.
Normality test used: Shapiro Francia.
W Statistic = 0.9729
W Quantile = 0.9555

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW12(01-05)
Date: 9/9/05, 11:42 AM Client: Regulatory Use View: BAF-MW12(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

SEASONALITY: MW12

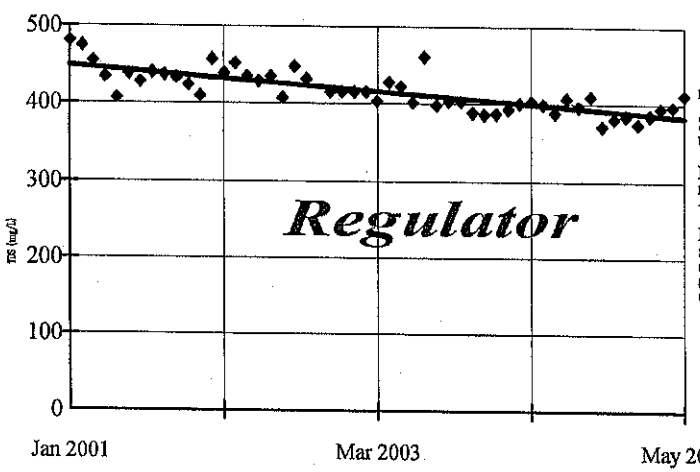
For the data shown, the Kruskal-Wallis test indicates NO SEASONALITY at the 5% significance level. Because the calculated Kruskal-Wallis statistic is less than or equal to the Chi-squared value, we conclude that no season has a significantly different median concentration of this constituent than any other season.
Calculated Kruskal-Wallis statistic = 2.005
Tabulated Chi-Squared value = 7.815 with 3 degrees of freedom at the 5% significance level.
There were 8 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.
Kruskal-Wallis statistic (H) = 2.003
Adjusted Kruskal-Wallis statistic (H') = 2.005



Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW12(01-05)
Date: 9/9/05, 11:42 AM Client: Regulatory Use View: BAF-MW12(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

SEN'S SLOPE ESTIMATOR
MW12



n = 52.

Slope = -15.359 units per year.

Mann Kendall normal approx. = -6.326.

Decreasing trend significant at 95% confidence level (two tailed).
Critical value = -1.96.

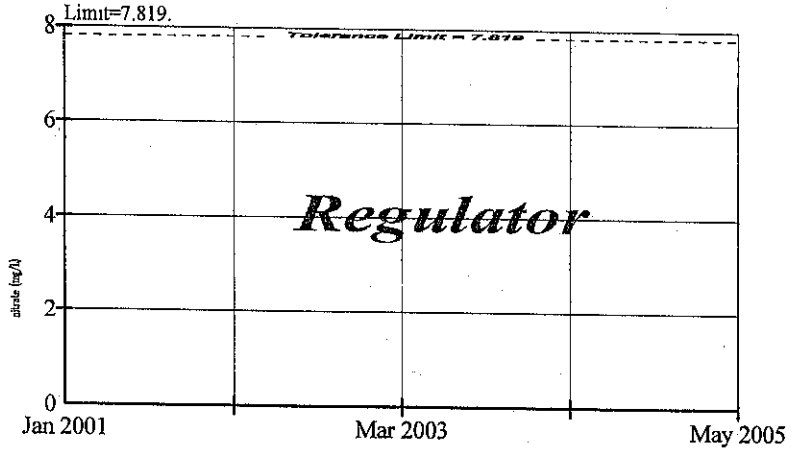
Eliminate Jan 01 – Apr 03 to get no signif decr trend

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW12(01-05)
Date: 9/9/05, 11:43 AM Client: Regulatory Use View: BAF-MW12(01-05)

Nitrate

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.n. 0.05

PARAMETRIC INTRA-WELL TOLERANCE LIMIT
MW12



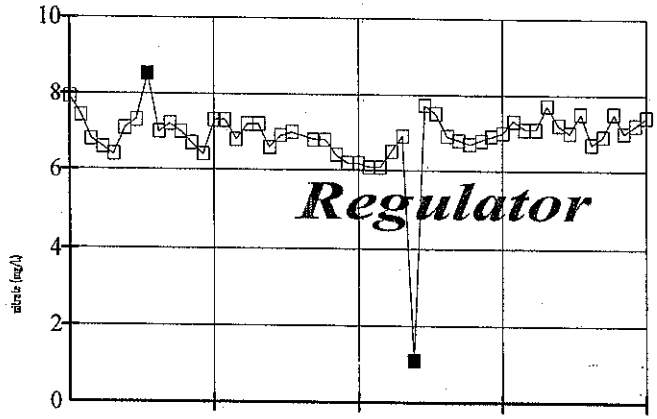
95% coverage. Background Data Summary: Mean=6.96, Std. Dev=0.416, 0% nds, 50 obs. Normality test used: Shapiro-Francia. Statistic for background data = 0.9808, W Quantile = 0.953. Testwise alpha = 0.05.

Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW12(01-05)
Date: 9/9/05, 11:35 AM Client: Regulatory Use View: BAF-MW12(01-05)

Nitrate

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.c. 0.05

OUTLIER ANALYSIS
MW12



Log-transformed:
Mean = 1.907, after outlier removal 1.942, 1.938.
Std. Dev. = 0.2643, after outlier removal 0.06597, 0.06023.
Critical Tn = 2.971, after outlier removal 2.964, 2.956.

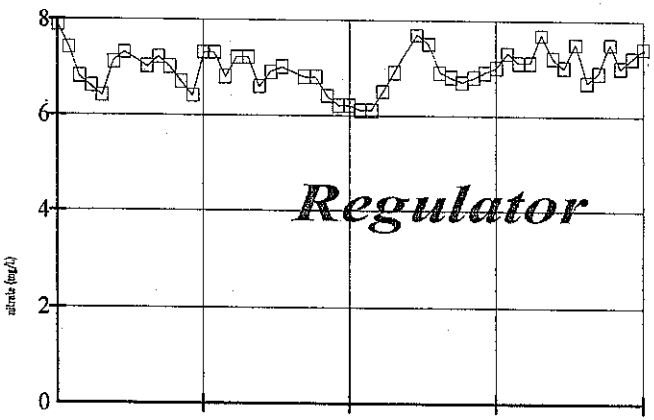
Statistical outliers are shown as solid squares.
Data, after outlier removal, were found to be normally distributed.
Normality test used: Shapiro Francia.
W Statistic = 0.9808
W Quantile = 0.953

Note: EPA guidance directs that statistical outliers should not be removed or altered unless independent evidence of an error exists.

Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW12(01-05)
Date: 9/9/05, 11:29 AM Client: Regulatory Use View: BAF-MW12(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.c. 0.05

OUTLIER ANALYSIS
MW12



Log-transformed:
Mean = 1.938.
Std. Dev. = 0.06023.
Critical Tn = 2.956.

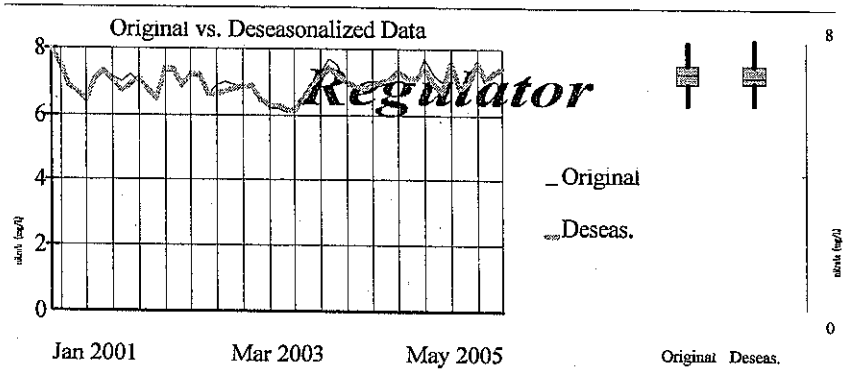
No statistical outliers are present.
Data were found to be normally distributed.
Normality test used: Shapiro Francia.
W Statistic = 0.9808
W Quantile = 0.953

Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW12(01-05)
Date: 9/9/05, 11:31 AM Client: Regulatory Use View: BAF-MW12(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.c. 0.05

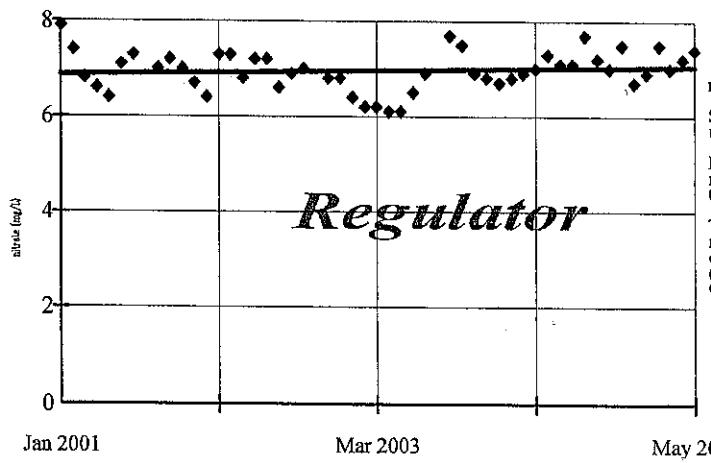
SEASONALITY: MW12

For the data shown, the Kruskal-Wallis test indicates NO SEASONALITY at the 5% significance level. Because the calculated Kruskal-Wallis statistic is less than or equal to the Chi-squared value, we conclude that no season has a significantly different median concentration of this constituent than any other season.
Calculated Kruskal-Wallis statistic = 6.213
Tabulated Chi-Squared value = 7.815 with 3 degrees of freedom at the 5% significance level.
There were 14 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.
Kruskal-Wallis statistic (H) = 6.171
Adjusted Kruskal-Wallis statistic (H') = 6.213



Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW12(01-05)
Date: 9/9/05, 11:31 AM Client: Regulatory Use View: BAF-MW12(01-05)

SEN'S SLOPE ESTIMATOR
MW12



n = 50.

Slope = 0.039 units per year.

Mann Kendall normal approx. = 0.932.

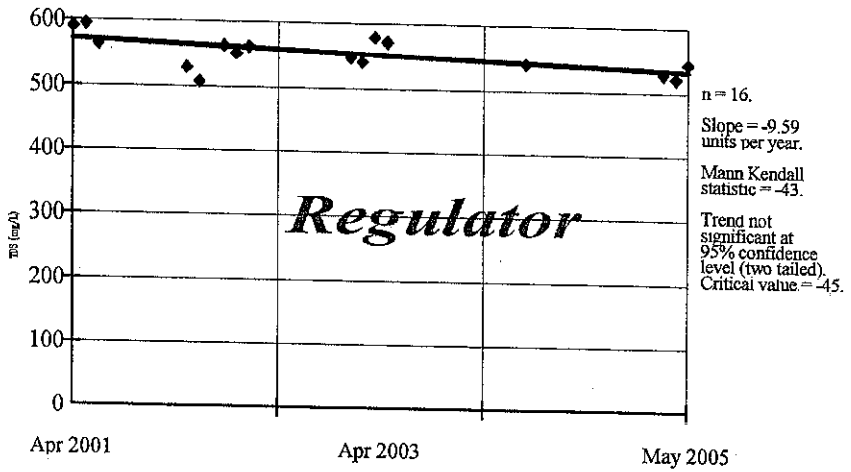
Trend not significant at 95% confidence level (two tailed).
Critical value = 1.96.

Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW12(01-05)
Date: 9/9/05, 11:32 AM Client: Regulatory Use View: BAF-MW12(01-05)

TDS

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

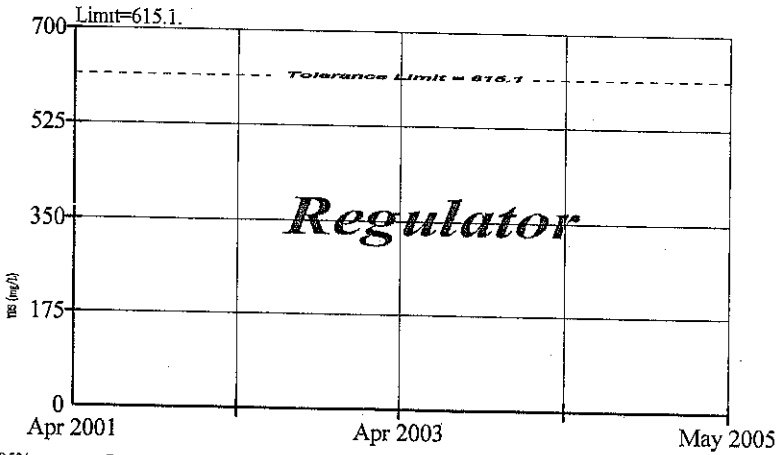
SEN'S SLOPE ESTIMATOR
MW3



Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW3(01-05)
Date: 9/9/05, 11:22 AM Client: Regulatory Use View: BAF-MW3(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

PARAMETRIC INTRA-WELL TOLERANCE LIMIT
MW3



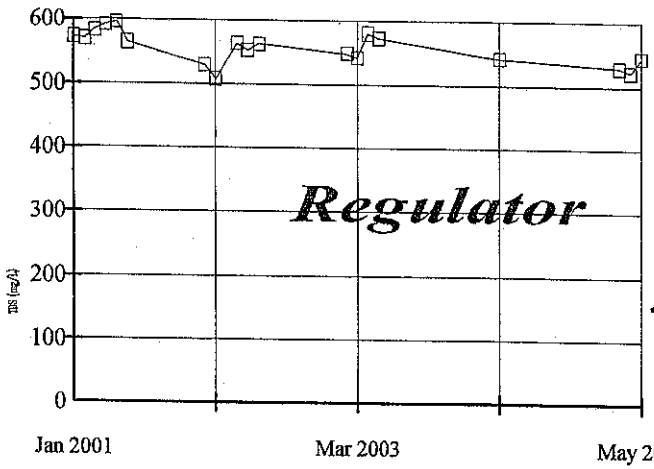
95% coverage. Background Data Summary: Mean=552.3, Std. Dev=24.87, 0% nds, 16 obs. Normality test used: Shapiro Wilk, W for background data = 0.9813, W Quantile = 0.887. Testwise alpha = 0.05.

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW3(01-05)
Date: 9/9/05, 11:22 AM Client: Regulatory Use View: BAF-MW3(01-05)

TDS

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.u. 0.05

OUTLIER ANALYSIS
MW3



Log-transformed:
Mean = 6.319.
Std. Dev. = 0.04395.
Critical Tn = 2.532.

No statistical outliers are present.
Data were found to be normally distributed.
Normality test used: Shapiro Wilk.
W Statistic = 0.9769
W Quantile = 0.901

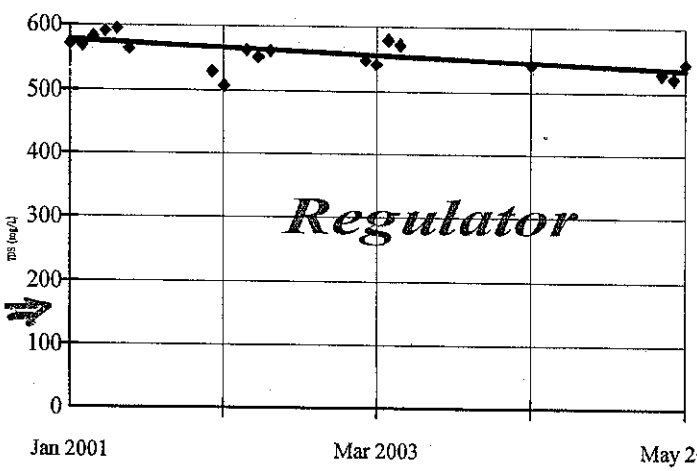
⇒ Seasonality - insuff data base ⇒

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW3(01-05)
Date: 9/9/05, 11:18 AM Client: Regulatory Use View: BAF-MW3(01-05)

11

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.u. 0.05

SEN'S SLOPE ESTIMATOR
MW3



n = 19.

Slope = -10.052 units per year.

Mann Kendall statistic = -71.

Decreasing trend significant at 95% confidence level (two tailed).
Critical value = -58.

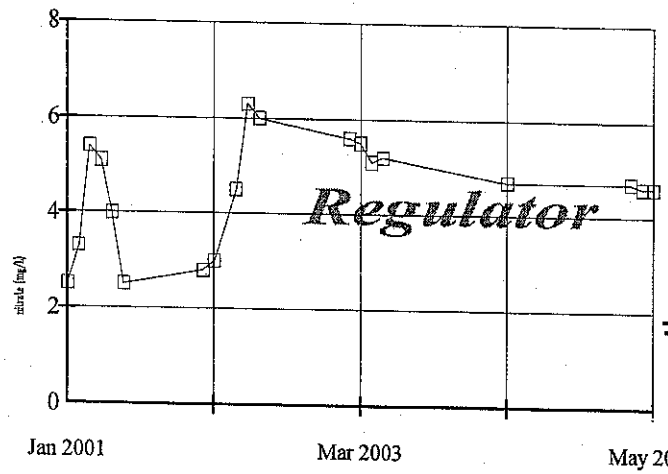
Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW3(01-05)
Date: 9/9/05, 11:19 AM Client: Regulatory Use View: BAF-MW3(01-05)

Eliminate Jan 01 - Mar 01 to get no signif trend →

Nitrate

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

OUTLIER ANALYSIS
MW3



Log-transformed:
Mean = 1.466.
Std. Dev. = 0.2922.
Critical Tn = 2.532.

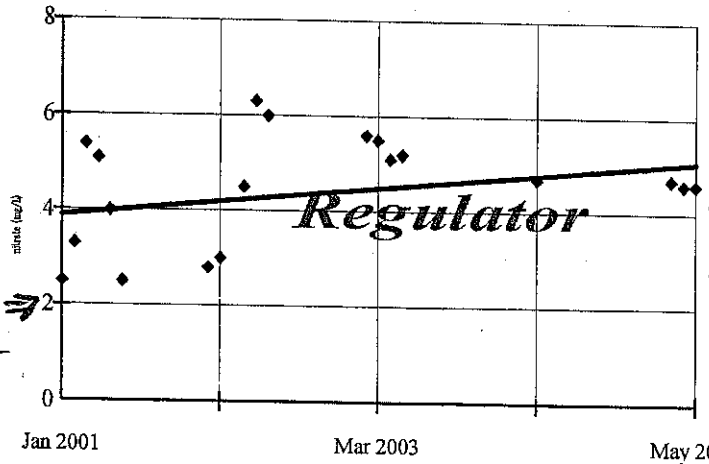
No statistical outliers are present.
Data were found to be normally distributed.
Normality test used: Shapiro Wilk.
W Statistic = 0.9257
W Quantile = 0.901

⇒ Seasonality - insuff data set ⇒

Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW3(01-05)
Date: 9/9/05, 10:39 AM Client: Regulatory Use View: BAF-MW3(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

SEN'S SLOPE ESTIMATOR
MW3



n = 19.

Slope = 0.272 units per year.

Mann Kendall statistic = 29.

Trend not significant at 95% confidence level (two tailed).
Critical value = 58.

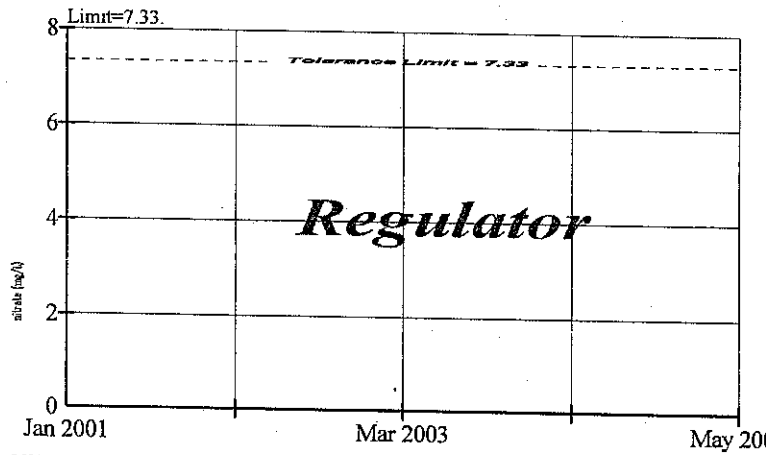
⇒

Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW3(01-05)
Date: 9/9/05, 10:40 AM Client: Regulatory Use View: BAF-MW3(01-05)

01

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

PARAMETRIC INTRA-WELL TOLERANCE LIMIT
MW3



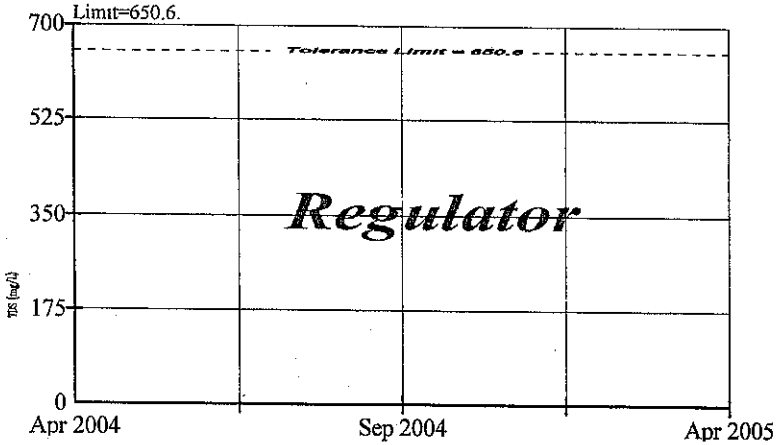
95% coverage. Background Data Summary: Mean=4.495, Std. Dev=1.17, 0% nds, 19 obs. Normality test used: Shapiro Wilk. W for background data = 0.9257, W Quantile = 0.901. Testwise alpha = 0.05.

Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW3(01-05)
Date: 9/9/05, 10:41 AM Client: Regulatory Use View: BAF-MW3(01-05)

TDS

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

PARAMETRIC INTRA-WELL TOLERANCE LIMIT
MW2



95% coverage. Background Data Summary: Mean=621.9, Std. Dev=8.454, 0% nds, 7 obs. Normality test used: Shapiro Wilk. W for background data = 0.9453, W Quantile = 0.803. Testwise alpha = 0.05.

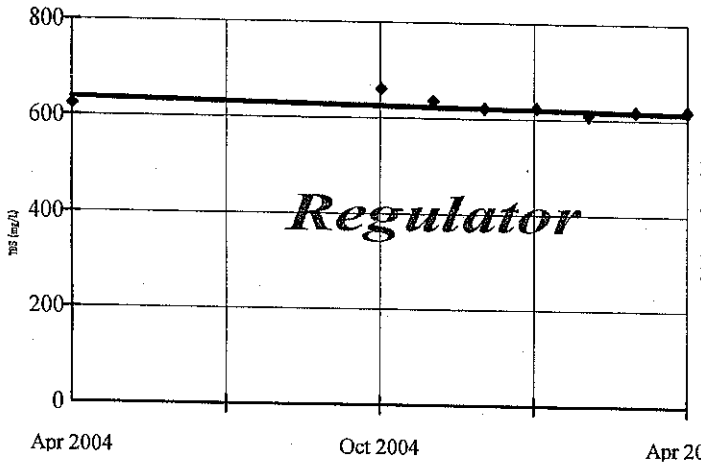
Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW2(01-05)
Date: 9/9/05, 10:26 AM Client: Regulatory Use View: BAF-MW2(01-05)

1-0

TDS

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

SEN'S SLOPE ESTIMATOR
MW2

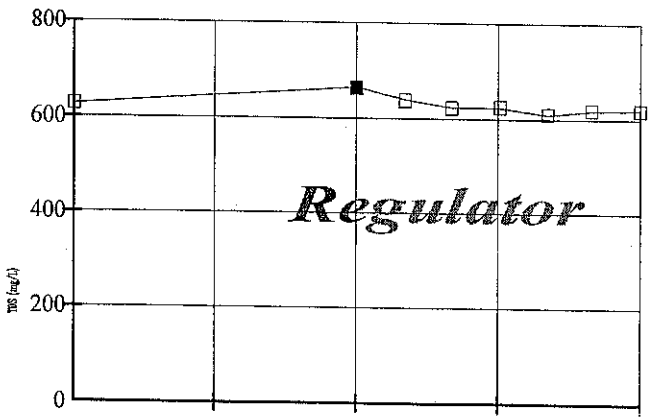


n = 8.
Slope = -25.01 units per year.
Mann Kendall statistic = -16.
Trend not significant at 95% confidence level (two tailed).
Critical value = -17.

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW2(01-05)
Date: 9/9/05, 10:22 AM Client: Regulatory Use View: BAF-MW2(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

OUTLIER ANALYSIS
MW2



Log-transformed:
Mean = 6.44, after outlier removal 6.433.
Std. Dev. = 0.02546, after outlier removal 0.01356.
Critical Tn = 2.032, after outlier removal 1.938.

Statistical outliers are shown as solid squares.
Data, after outlier removal, were found to be normally distributed.
Normality test used: Shapiro Wilk.
W Statistic = 0.9453
W Quantile = 0.803

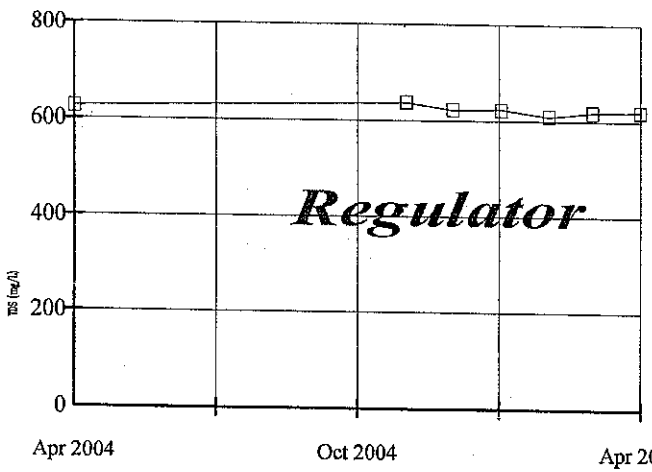
Note: EPA guidance directs that statistical outliers should not be removed or altered unless independent evidence of an error exists.

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW2(01-05)
Date: 9/9/05, 10:22 AM Client: Regulatory Use View: BAF-MW2(01-05)

92

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

OUTLIER ANALYSIS
MW2



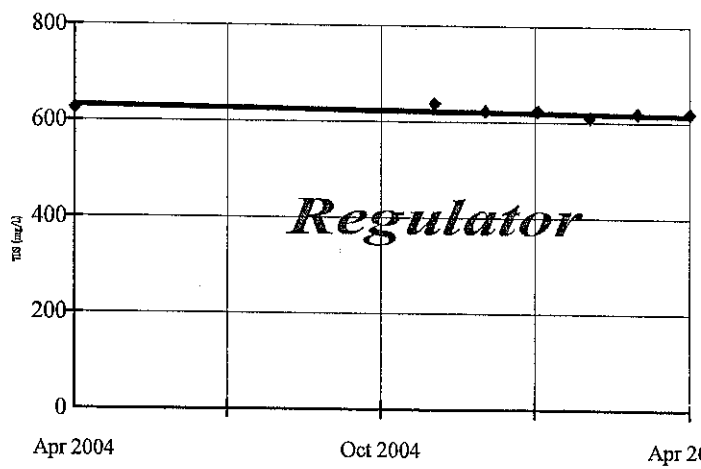
Log-transformed:
Mean = 6.433.
Std. Dev. = 0.01356.
Critical Tn = 1.938.

No statistical outliers are present.
Data were found to be normally distributed.
Normality test used: Shapiro Wilk.
W Statistic = 0.9453
W Quantile = 0.803

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW2(01-05)
Date: 9/9/05, 10:22 AM Client: Regulatory Use View: BAF-MW2(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

SEN'S SLOPE ESTIMATOR
MW2



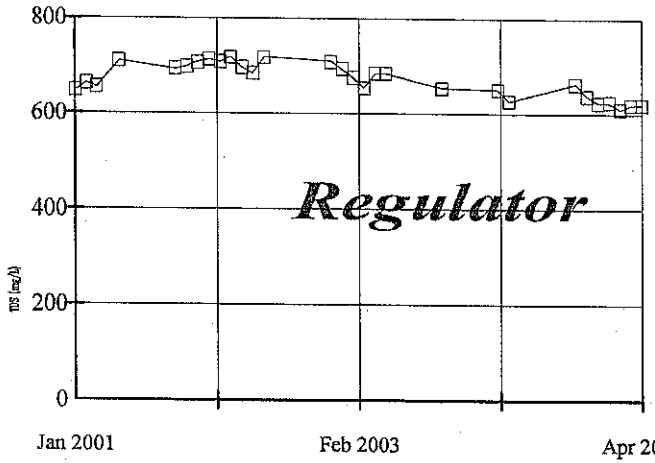
n = 7.
Slope = -16.221 units per year.
Mann Kendall statistic = -11.
Trend not significant at 95% confidence level (two tailed).
Critical value = -15.

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW2(01-05)
Date: 9/9/05, 10:22 AM Client: Regulatory Use View: BAF-MW2(01-05)

TDS

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

OUTLIER ANALYSIS
MW2



Log-transformed:
Mean = 6.505.
Std. Dev. = 0.05182.
Critical Tn = 2.73 .

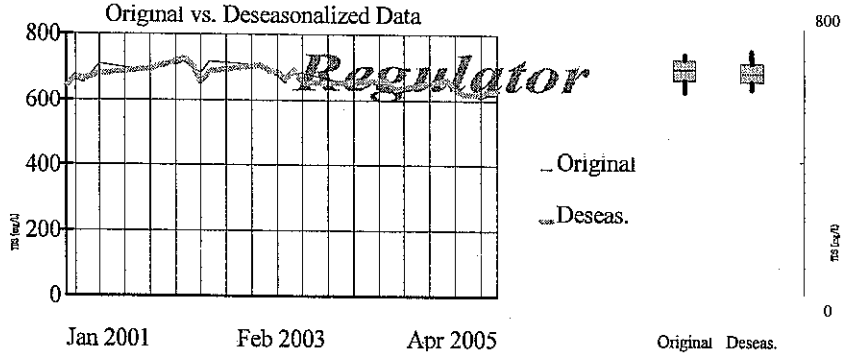
No statistical outliers are present.
Data were found to be neither normally nor log-normally distributed; user chose to continue.
Normality test used: Shapiro Wilk.
W Statistic = 0.9208
W Quantile = 0.926

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW2(01-05)
Date: 9/9/05, 10:15 AM Client: Regulatory Use View: BAF-MW2(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

SEASONALITY: MW2

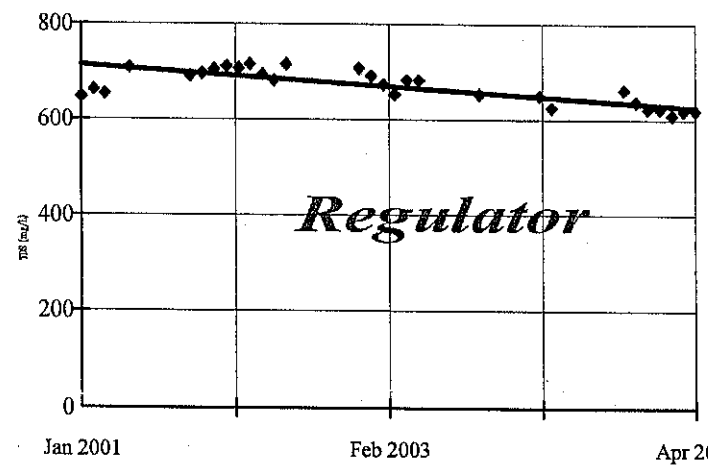
For the data shown, the Kruskal-Wallis test indicates NO SEASONALITY at the 5% significance level. Because the calculated Kruskal-Wallis statistic is less than or equal to the Chi-squared value, we conclude that no season has a significantly different median concentration of this constituent than any other season.
Calculated Kruskal-Wallis statistic = 3.986
Tabulated Chi-Squared value = 7.815 with 3 degrees of freedom at the 5% significance level.
There were 5 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.
Kruskal-Wallis statistic (H) = 3.978
Adjusted Kruskal-Wallis statistic (H') = 3.986



Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW2(01-05)
Date: 9/9/05, 10:16 AM Client: Regulatory Use View: BAF-MW2(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

SEN'S SLOPE ESTIMATOR
MW2



n = 29.
Slope = -21.17 units per year.
Mann Kendall statistic = -205.
Decreasing trend significant at 95% confidence level (two tailed).
Critical value = -106.

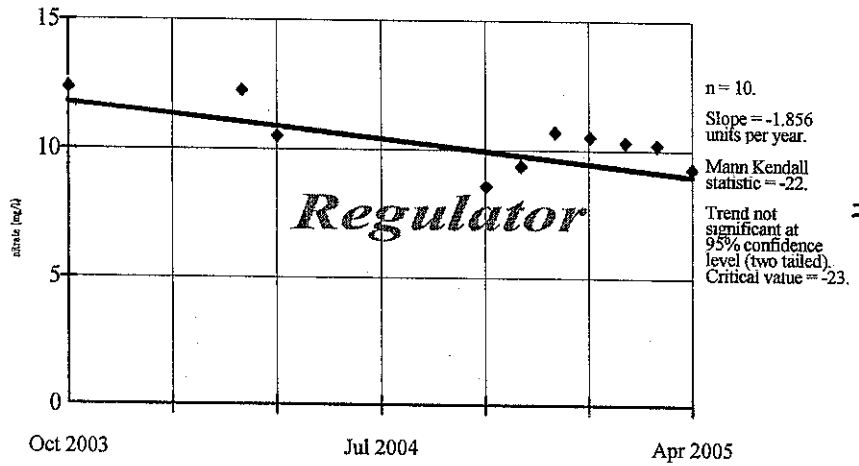
Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW2(01-05)
Date: 9/9/05, 10:16 AM Client: Regulatory Use View: BAF-MW2(01-05)

Eliminate Jan 01 - Mar 04 to get no signif trend

NO3

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.n. 0.05

SEN'S SLOPE ESTIMATOR
MW2



n = 10.

Slope = -1.856 units per year.

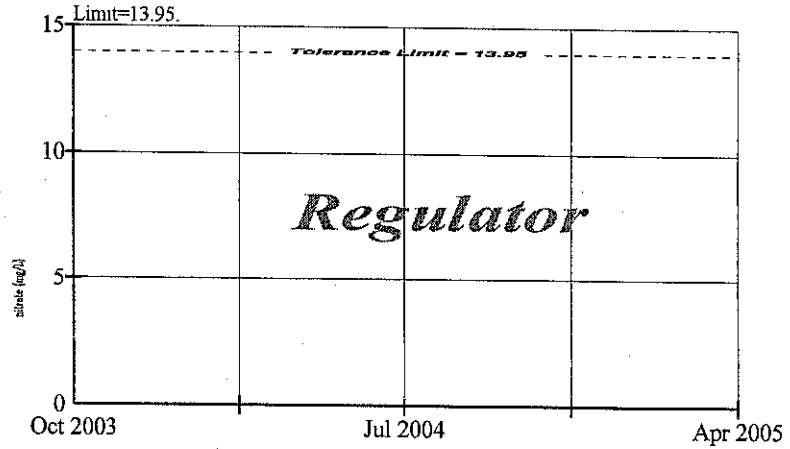
Mann Kendall statistic = -22.

Trend not significant at 95% confidence level (two tailed). Critical value = -23.

Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW2(01-05)
Date: 9/9/05, 10:08 AM Client: Regulatory Use View: BAF-MW2(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.n. 0.05

PARAMETRIC INTRA-WELL TOLERANCE LIMIT
MW2



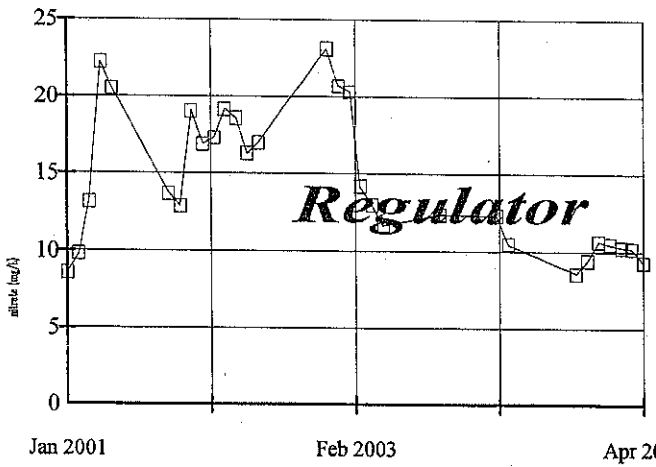
95% coverage. Background Data Summary: Mean=10.42, Std. Dev=1.212, 0% nds, 10 obs. Normality test used: Shapiro Wilk. W for background data = 0.9222, W Quantile = 0.842. Testwise alpha = 0.05.

Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW2(01-05)
Date: 9/9/05, 10:08 AM Client: Regulatory Use View: BAF-MW2(01-05)

Nitrate

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

OUTLIER ANALYSIS
MW2



Log-transformed:
Mean = 2.622.
Std. Dev. = 0.3074.
Critical Tn = 2.745.

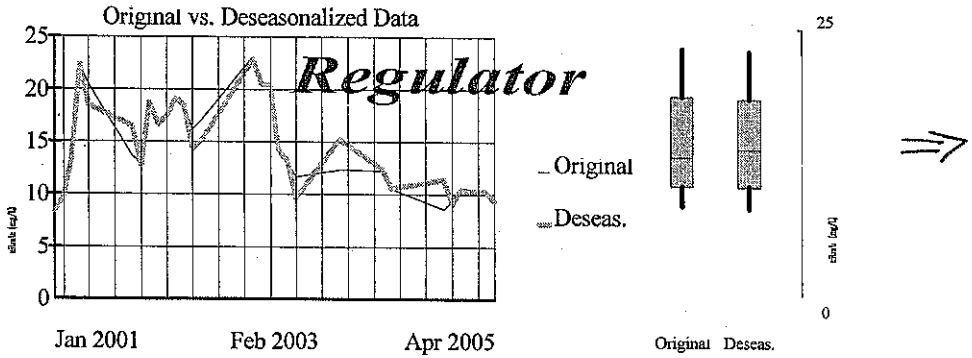
No statistical outliers are present.
Data were found to be log-normally distributed.
Normality test used: Shapiro Wilk.
W Statistic = 0.9333
W Quantile = 0.927

Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW2(01-05)
Date: 9/9/05, 10:01 AM Client: Regulatory Use View: BAF-MW2(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

SEASONALITY: MW2

For the data shown, the Kruskal-Wallis test indicates NO SEASONALITY at the 5% significance level. Because the calculated Kruskal-Wallis statistic is less than or equal to the Chi-squared value, we conclude that no season has a significantly different median concentration of this constituent than any other season.
Calculated Kruskal-Wallis statistic = 1.797
Tabulated Chi-Squared value = 7.815 with 3 degrees of freedom at the 5% significance level.
There were 2 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.
Kruskal-Wallis statistic (H) = 1.796
Adjusted Kruskal-Wallis statistic (H') = 1.797

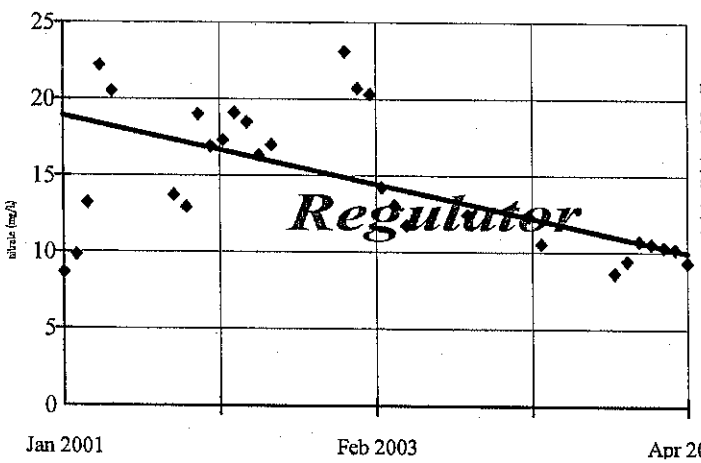


Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW2(01-05)
Date: 9/9/05, 10:03 AM Client: Regulatory Use View: BAF-MW2(01-05)

5

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

SEN'S SLOPE ESTIMATOR
MW2



n = 30.

Slope = -2.117 units per year.

Mann Kendall statistic = -163.

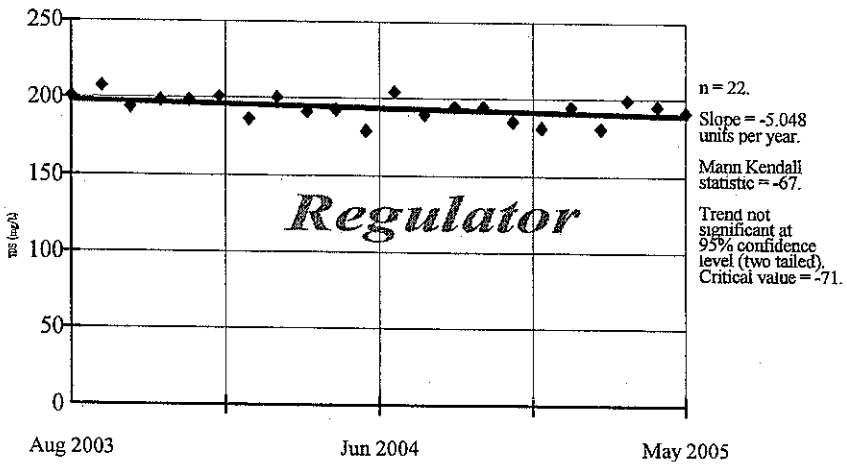
Decreasing trend significant at 95% confidence level (two tailed).
Critical value = -112.

Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW2(01-05)
Date: 9/9/05, 10:04 AM Client: Regulatory Use View: BAF-MW2(01-05)

Eliminate Jan 01 – May 03 to get no signif trend →

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.a. 0.05

SEN'S SLOPE ESTIMATOR (Alt. Values)
MW1



Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW1(01-05)
Date: 8/30/05, 3:21 PM Client: Regulatory Use View: BAF-MW1(01-05)

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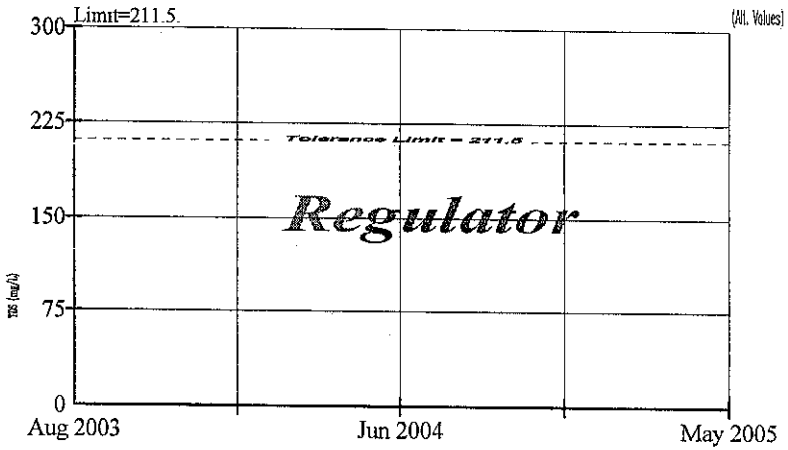
PARAMETRIC INTRA-WELL TOLERANCE LIMIT
TDS
MW1



95% coverage. Background Data Summary: Mean=193.8, Std. Dev=7.536, 0% nds, 22 obs. Normality test used: Shapiro Wilk. for background data = 0.9681, W Quantile = 0.911. Testwise alpha = 0.05.

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW1(01-05)
Date: 8/30/05, 3:22 PM Client: Regulatory Use View: BAF-MW1(01-05)

TDS

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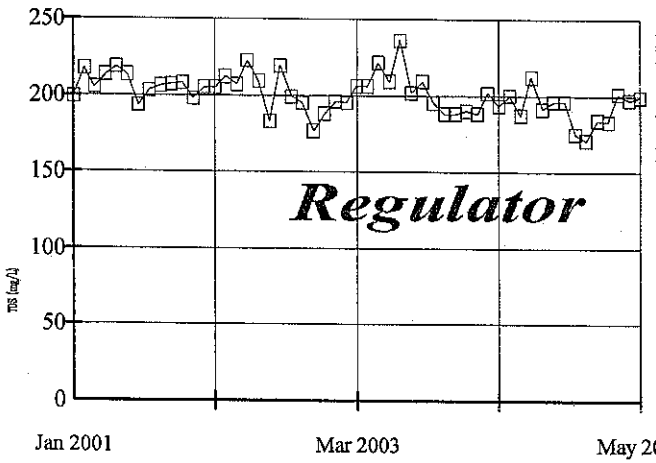
OUTLIER ANALYSIS (~~Alt. Values~~)
MW1



Log-transformed:
Mean = 5.298.
Std. Dev. = 0.06364.
Critical Tn = 2.978.

No statistical outliers are present.
Data were found to be normally distributed.
Normality test used: Shapiro Francia.
W Statistic = 0.9856
W Quantile = 0.957

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW1(01-05)
Date: 8/30/05, 3:13 PM Client: Regulatory Use View: BAF-MW1(01-05)

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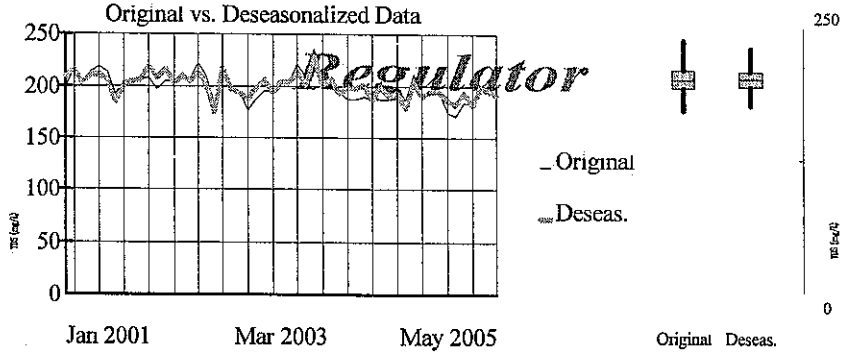
SEASONALITY: MW1 (Alt. Values)

For the data shown, the Kruskal-Wallis test indicates SEASONALITY at the 5% significance level. Because the calculated Kruskal-Wall statistic is greater than the Chi-squared value, we conclude that at least one season has a significantly different median concentration of this constituent than any other season.
Calculated Kruskal-Wallis statistic = 12.144
Tabulated Chi-Squared value = 7.815 with 3 degrees of freedom at the 5% significance level.
There were 13 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.
Kruskal-Wallis statistic (H) = 12.124
Adjusted Kruskal-Wallis statistic (H') = 12.144



Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW1(01-05)
Date: 8/30/05, 3:14 PM Client: Regulatory Use View: BAF-MW1(01-05)

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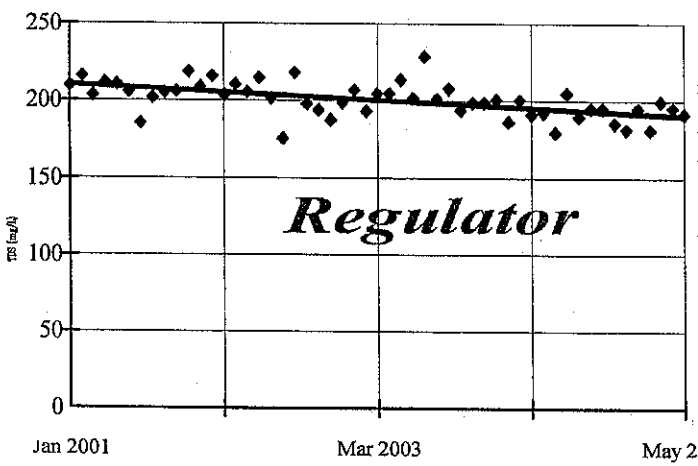
SEN'S SLOPE ESTIMATOR (Alt. Values)
MW1



n = 53.

Slope = -4.643 units per year.

Mann Kendall normal approx. = -4.412.

Decreasing trend significant at 95% confidence level (two tailed).
Critical value = -1.96.

Constituent: TDS (mg/L) Facility: Landfill X Data File: BAF-MW1(01-05)
Date: 8/30/05, 3:15 PM Client: Regulatory Use View: BAF-MW1(01-05)

Elim Jan 01 - July 03 to get
⇒ no signif decreasing trend

next page

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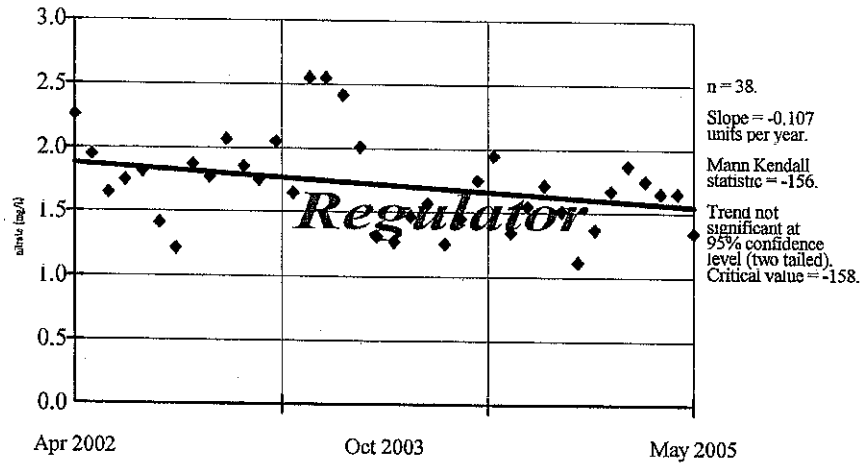
SEN'S SLOPE ESTIMATOR (Alt. Values)
MW1

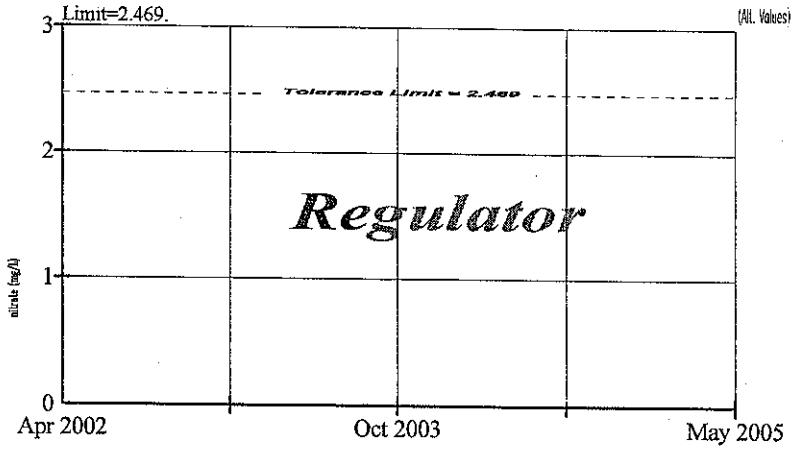


Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW1(01-05)
Date: 8/30/05, 3:00 PM Client: Regulatory Use View: BAF-MW1(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.n. 0.05

PARAMETRIC INTRA-WELL TOLERANCE LIMIT
MW1

NO_3



95% coverage. Background Data Summary: Mean=1.715, Std. Dev=0.3521, 0% nds, 38 obs. Normality test used: Shapiro Wilk. Statistic for background data = 0.9521, W Quantile = 0.938. Testwise alpha = 0.05.

Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW1(01-05)
Date: 8/30/05, 3:02 PM Client: Regulatory Use View: BAF-MW1(01-05)

Nitrate

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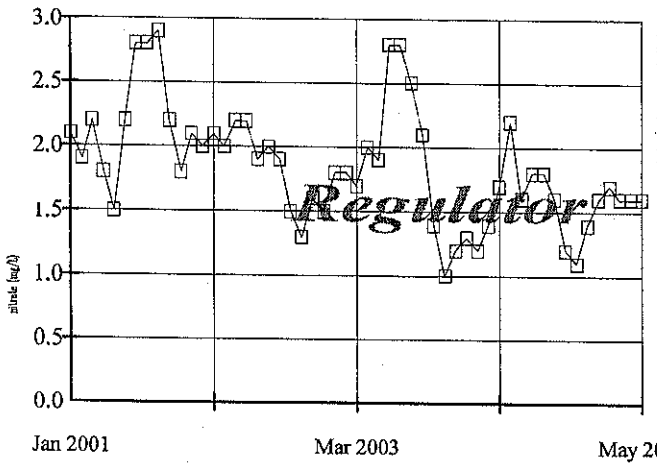
OUTLIER ANALYSIS
MW1



Log-transformed:
Mean = 0.5838.
Std. Dev. = 0.248.
Critical Tn = 2.978.

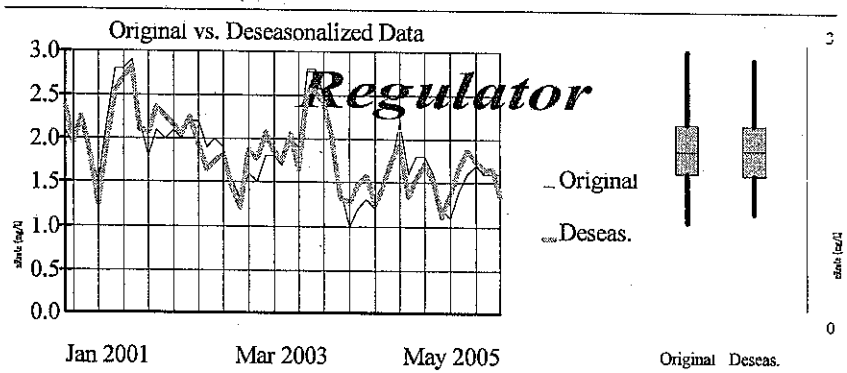
No statistical outliers are present.
Data were found to be normally distributed.
Normality test used:
Shapiro Francia.
W Statistic = 0.9602
W Quantile = 0.957

Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW1(01-05)
Date: 8/30/05, 2:52 PM Client: Regulatory Use View: BAF-MW1(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.c. 0.05

SEASONALITY: MW1

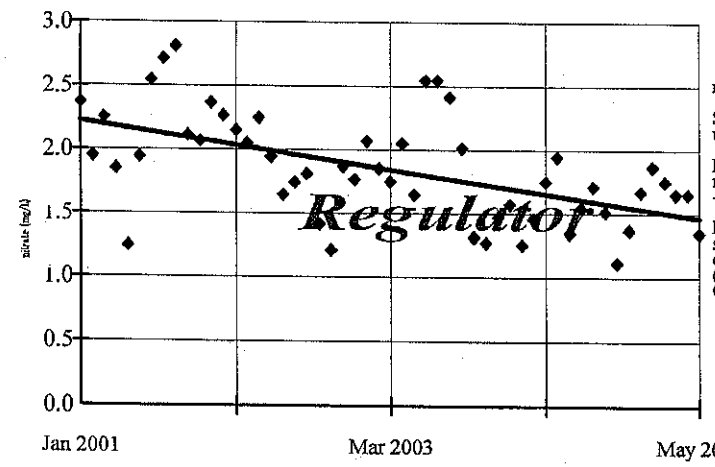
For the data shown, the Kruskal-Wallis test indicates SEASONALITY at the 5% significance level. Because the calculated Kruskal-Wall statistic is greater than the Chi-squared value, we conclude that at least one season has a significantly different median concentration of this constituent than any other season.
Calculated Kruskal-Wallis statistic = 8.012
Tabulated Chi-Squared value = 7.815 with 3 degrees of freedom at the 5% significance level.
There were 12 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.
Kruskal-Wallis statistic (H) = 7.952
Adjusted Kruskal-Wallis statistic (H') = 8.012



Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW1(01-05)
Date: 8/30/05, 2:52 PM Client: Regulatory Use View: BAF-MW1(01-05)

v.8.5.09. For regulatory purposes only. CAS# n/a EPA m.c. 0.05

SEN'S SLOPE ESTIMATOR (Alt. Values)
MW1



n = 53.

Slope = -0.175 units per year.

Mann Kendall normal approx. = -4.06.

Decreasing trend significant at 95% confidence level (two tailed).
Critical value = -1.96.

Constituent: nitrate (mg/L) Facility: Landfill X Data File: BAF-MW1(01-05)
Date: 8/30/05, 2:55 PM Client: Regulatory Use View: BAF-MW1(01-05)

⇒ Elim Jan 01 – Mar 02 to get no signif decr. trend → next page

ADDENDUM 2

Background Ground Water Analysis